DRAFT
INITIAL STUDY AND
MITIGATED NEGATIVE DECLARATION
SHERMAN ISLAND WHALE'S MOUTH WETLAND RESTORATION PROJECT

Reclamation District 341
Sacramento County, CA
September 10, 2013

Draft Mitigated Negative Declaration

for the

Sherman Island Whales Mouth Wetland Restoration Project

Sherman Island, CA

Project Description: The Sherman Island Whales Mouth Wetland Restoration Project (Project) will restore approximately 600 acres of palustrine emergent wetlands, within an 877-acre Project boundary, on a nearly 975-acre parcel of property on Sherman Island that is owned by the California Department of Water Resources. The property is currently managed for flood irrigated pasture land which includes a regular and extensive disturbance regime associated with field prepping, disking, and grazing.

Approximately 550,000 cubic yards of material will be redistributed within the site, which is necessary to sculpt the swales and to create berms for this wetland habitat area. An additional import of approximately 80,000 cubic yards of material will be required to fill the existing scour pond and bring the site up to grade for the native upland habitat restoration proposed in that area. Approximately 27 water control structures will be installed. The interior of the site will be divided up into as many as seven managed wetland units separated by 47,000 lineal feet of proposed interior berms, and crossed with excavated conveyance swales, in order to facilitate appropriate water and vegetation management capabilities. Water levels in each unit will be managed independently to restore the desired emergent wetland conditions throughout the site. When the Project is completed, water is proposed to be maintained on the Project Site year-round, effectively creating a permanent wetland.

Post construction operation of the site will include water delivery via the existing gravity siphons along the San Joaquin River Levee and seepage. Water will be conveyed within the wetland system via gravity flow from the higher elevation units to the lower elevation units until it is discharged from the site into the existing drainage canal that flows to the east.

Pending permit approvals, construction will begin in May 2014. Initial site preparation includes vegetation removal prior to earth moving activities. Construction will stop by 15 October 2014. If work is not completed in 2014, it will commence again in May 2015 and May 2016 (if necessary). Work will be scheduled to accommodate approved giant garter snake work windows. Earth moving activities will be performed by a licensed contractor, utilizing agricultural scrapers and excavators to construct the site's interior and perimeter berms, loafing islands, swales and potholes, while an excavator and/or backhoe will be used to construct conveyance ditches and install necessary piping.

The ultimate outcome of the Project will be hundreds of additional acres of freshwater emergent wetlands. Each wetland unit will be a mosaic of open water channels and emergent vegetation comprised predominantly of California bulrush (*Schoenoplectus/Scirpus californicus*) and narrow leaved cattails (*Typha angustifolia*). Other native plant restoration components will include installation of native trees and shrubs compatible with their respective hydrologic regime as well as a substantial amount of upland transitional area, all of which will provide a diversity of habitat structure and function.

Project Location: The approximately 877- acre Project is located on Sherman Island, Assessor's Parcel Number 158-0090-016-0000 (this parcel comprising a total of 975 acres), in southwest Sacramento County, CA and is shown on the Antioch North, CA USGS topographic quadrangle. This un-sectionalized portion of Sherman Island would be considered to be generally located within Sections 4, 5, 8, and 9, Township 2N Range 2E.

The Project is located approximately 12.0 miles southwest of the City of Isleton, north of the city of Antioch, and west of Highway 160. The approximate center of the site is located at Latitude 38° 2'29.02"N, Longitude 121°46'24.56"W.

Project Proponent: Reclamation District 341 c/o Gallery & Barton, 1112 I Street, Suite 240, Sacramento, CA 95814; Contact: Mr. Jesse Barton, (916) 444-2880.

Proposed Finding and Basis: Although the proposed Project could have a significant effect on the environment, there will not be a significant effect in this case because the District (RD 341) has agreed to reduce those effects by incorporating mitigation measures into the Project. The mitigation measures are set forth in Appendix D to this document.

Authority and Points of Contact: This document reflects the independent judgment of Reclamation District 341. This Mitigated Negative Declaration is filed pursuant to Section 15072 of the Guidelines for Implementation of the California Environmental Quality Act. The Initial Study and other project information are available for review by calling Mr. Jesse Barton at (916) 444-2880.

Review of Mandatory Findings of Significance:

- ☐ The Project does not have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory.
- ☐ The Project does not have the potential to achieve short-term environmental goals to the disadvantage of long-term environmental goals.
- ☐ The Project does not have impacts that are individually limited, but cumulatively considerable.
- ☐ The Project does not have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly.

Determination: On the basis of this Initial Study, I find that the proposed Project will not have a significant effect on the environment, and that this Mitigated Negative Declaration has been drafted in accordance with the California Environmental Quality Act.

_____ Date: _____, 2013

Juan Mercado, Jr., President
Reclamation District 341

Initial Study

for the

Sherman Island Whales Mouth Wetland Restoration Project

Twitchell Island, CA

1. **Project title:**
   Sherman Island Whales Mouth Wetland Restoration Project

2. **Lead agency name and address:**
   Reclamation District 341
   c/o Gallery & Barton
   1112 I Street, Suite 240
   Sacramento, CA 95814

3. **Contact person and phone number:**
   Gallery & Barton
   1112 I Street, Suite 240
   Sacramento, CA 95814
   Phone: 916/ 444-2880
   Contact: Mr. Jesse Barton

4. **Project location:**
   The approximately 877-acre Sherman Island Whales Mouth Wetland Restoration Project (Project) is located on Sherman Island; Assessor's Parcel Numbers 158-0090-016-0000, in southwest Sacramento County, CA and is shown on the Antioch North, CA USGS topographic quadrangle. This un-sectionalized portion of Sherman Island would be considered to be generally located within Sections 4, 5, 8, and 9, Township 2N Range 2E. The Project is located approximately 12.0 miles southwest of the City of Isleton, 3.0 miles north of the city of Antioch, and 0.25 miles west of Highway 160. The approximate center of the site is located at Latitude 38° 2'29.02"N, Longitude 121°46'24.56"W.

5. **Project sponsor's name and address:**
   Reclamation District 341
   c/o Gallery & Barton
   1112 I Street, Suite 240
   Sacramento, CA 95814

6. **General plan designation:**
   Agricultural Cropland

7. **Zoning:**
   AG-80 (F). Agricultural with a minimum lot area requirement of 80 acres. The Project Site is located within a floodplain combining zone.

8. Description of the Project:

Purpose

The ultimate purpose of the Project is to restore approximately 600 acres of permanent palustrine emergent wetlands and upland habitat within an 877-acre Project boundary through a combination of reestablishment and rehabilitation. The intent of the Project is to stop or reverse subsidence, provide native habitat for a diversity of wildlife, and sequester atmospheric carbon. By maintaining permanent and adequate water levels, the growth and subsequent decomposition of emergent vegetation is expected to grow peat which will raise surface elevations on the property. The Project is expected to provide year-round wetland and upland habitat for waterfowl and other wildlife.

The Project will provide climate benefits by sequestering atmospheric carbon dioxide (CO_2) that will help provide a net reduction in greenhouse gases (GHGs). Pending the availability of funding, the Project Site will provide an opportunity for researchers to use on-site monitoring and data from applied research sites on Sherman and Twitchell Islands to quantify climate benefits. GHG reductions quantified for the site's permanent water management regime have the potential to be extrapolated to other similar sites throughout the Delta.

Background

The Project Site is located on Sherman Island in southwest Sacramento County, California on assessor parcel number 158-0090-016-0000, owned by the Department of Water Resources (DWR). Sherman Island is protected by approximately 18-miles of levee which encompass approximately 9,937 acres of land, according to the 1995 Sacramento Delta San Joaquin Atlas. Approximately nine miles of levee are project levee, constructed by the US Army Corps of Engineers, and approximately nine miles of levee are non-project levee. The entire levee system is maintained by RD 341. The Project Site is owned by DWR. Historically, the project area was a marsh that was diked off from the Sacramento River and drained between 1850 and 1873 to facilitate agriculture. As a result of more than 130 years of farming practices, irrigation, and exposure of soils to air, the Island has subsided as much as 16 ft. A high water table currently makes the Project Site unsustainable for long-term agriculture.

Before the Delta was diked, drained, and farmed, it was subject to significant seasonal fluctuations in freshwater inflows, which worked in concert with large tidal ranges. Natural levees were formed by sediments deposited during spring floods and stabilized by vegetation. Dominant vegetation within the natural levees included tules - marsh plants that live in fresh and brackish water. Decomposing tules and reed vegetation formed the peat soils over thousands of years. In waterlogged conditions, decaying tules decompose slowly to release carbon dioxide and methane, which is trapped in the soils by water. Once the soil was diked and then dried, the peat soils decompose, which leads to compaction and subsidence.

Subsidence has reduced the distance from the soil surface to the water table. The resulting high water table makes the Site unsustainable for crop production, although much of the Site is currently used for corn production and pasture.

The goal of the Project is to address the subsidence on Sherman Island and also a pond adjacent to a levee that presents seepage issues. In January 1969, Sherman Island's southern levee breached near the Antioch Bridge adjacent to the San Joaquin River, flooding Sherman Island for approximately six months until the levee could be repaired and the Island pumped out. The high velocity of water rushing in to this relatively small area scoured out the soil adjacent to where the levee once was, resulting in a large and deep hole that is approximately 6.5 acres, next to the levee. In the 1970s and 80s, Reclamation District 341 partially

filled this hole (that was once as much as 40 feet deep) by placing dredge spoil materials in the pond. Currently the pond is much shallower with an average depth of approximately five feet but as deep as 14 feet in some locations.

Recently, Reclamation District 341 has constructed several levee improvement projects along this section of levee, including approximately 6100 feet of habitat setback levees and other levee improvement projects. However, this section of levee continues to be very unstable due to the deep peat foundation. Several cracks have been noticed on the landside levee bench, indicating shear strain and slippage of the levee foundation. Fortunately, areas that are above ground that show cracking can be monitored and addressed before levee failure occurs, but in the scour pond area potential failure points cannot be seen or monitored because of the standing water. This inability to monitor the foundation so close to the levee creates a situation that must be resolved.

The first element of the Project includes creating new wetland on the interior of the island adjacent to the scour pond site, and preparing transitional upland habitat areas
Development of the Project provides a unique opportunity to restore the scour pond to upland and wetland habitat, which transitions from dry to wet moving away from the levee, allowing both enhanced levee stability and flood protection, as well as creating a much needed upland restoration area for wildlife. The second element of the Project (i.e. the scour pond portion of the Project) will consist of filling in the scour pond with a pervious soil, such as sand and/or gravel, creating a transitional slope and providing a perimeter drainage system that will wick water away from the site and into the surrounding wetlands. The upper soil strata will incorporate organic soil and be planted with native grasses to create an upland transition berm conducive for upland wildlife and birds of prey.

The third element of the Project includes a year of pre-planting land management of the upland habitat areas to aid in the eradication of invasive weeds prior to planting in Fall 2015. Following construction, the upland area will be seeded with native grasses and forbs, and will undergo a year of invasive weed management activities prior to planting with native vegetation. DWR is reevaluating how their properties in the region are managed and is particularly interested in incorporating land-use practices that reduce or reverse subsidence. Research on DWR-owned property on Twitchell Island has shown that permanently flooded emergent wetlands gain land surface elevation. Therefore, DWR is interested in restoring the entire Site back to the palustrine emergent wetland type that existed in the early part of last century. In addition, subsidence reversal in the project area will be monitored and evaluated with the hope of undertaking similar projects elsewhere in the Delta.

Project Description

The Project focuses on the restoration of palustrine emergent wetlands, complemented with upland riparian forest, scrub shrub, and grassland to add diversity of structure and habitat to the site. Restoration of wetlands will be accomplished by upgrading existing water management infrastructure and installing new infrastructure such as water control structures and water conveyance channels. In addition, the height of some existing berms will be increased and the Project will create habitat loafing islands. When the Project is completed, water will be maintained on the Project Site year-round, effectively creating a permanent wetland. Restoring permanent wetlands on Delta islands has been shown to halt and reverse subsidence. This Project will combine the wildlife benefits of wetland restoration with the importance of reversing Delta island subsidence. Upland vegetation will be planted on a higher elevation area adjacent to the wetland. Pending permit approval, site preparation will begin in May 2014. All construction activities in 2014 will be completed by October 15. If work is not completed in 2014, it will commence again in May 2015. All work will be performed on-site.

Planned Construction

During construction of the Project, perimeter ditches, perimeter berms, interior berms, interior water conveyance channels and water control structures will be installed or improved. In addition, loafing islands will be constructed.

It is anticipated that the Project will excavate approximately 550,000 cubic yards from various locations within the Project Site and relocate that material in different areas to build the necessary project features. No material will be exported and a cut fill balance will be achieved where possible. An additional import of approximately 80,000 cubic yards of materials will be required to fill the existing scour pond and bring the site up to grade for the native upland habitat restoration proposed in that area. Details of planned improvements to water management infrastructure and construction of additional infrastructure required to manage the Site as emergent wetlands are described below. Fill may be imported by truck or barge as needed.

A new 3 foot high perimeter berm will be constructed around the western, eastern, southern and northern boundary of the site to ensure water levels can be maintained at the required elevation. The berm height is based on the results of an extensive topographic survey that indicates the elevation of the site ranges from 7.5 to 16 ft below sea level. The perimeter berm will have at least 3.0 ft of freeboard and a 12-ft top width. Berm height above existing ground will vary depending on existing topography (Figure 4). Materials to create the perimeter berm will be obtained onsite from the creation of swales and other open water areas.

Development of perimeter and transition berms will allow water levels to be increased to restore and maintain permanently flooded emergent wetland on-site. The top of the improved perimeter berm elevation will vary; however, the typical height will be approximately 8-10 ft below sea level.

Approximately 27 water control structures will be installed. The interior of the site will be divided up into 9 managed wetland units, separated by 47,000 lineal feet of proposed interior berms, and crossed with conveyance swales, in order to facilitate appropriate water and vegetation management capabilities. Water levels in each unit will be managed independently to restore the desired emergent wetland conditions throughout the site. When the Project is completed, water is proposed to be maintained in the project area year-round, effectively creating a permanent wetland.

Water will be conveyed within the wetland system via gravity flow from the higher elevation units to the lower elevation units until it finally makes its way back to the District's drainage canal, to the east of the project boundary. The ultimate outcome of the Project will be approximately 600 acres of freshwater emergent wetlands. Each wetland unit will be a mosaic of open water channels and emergent vegetation comprised predominantly of species such as California bulrush (*Schoenoplectus californicus*) and narrow leaved cattails (*Typha angustifolia*). Other native plant restoration components will include installation of native trees and shrubs compatible with their respective hydrologic regime as well as a substantial amount of upland transitional area, all of which will provide great diversity and increased habitat opportunity for wildlife.

Interior water conveyance channels will be excavated in the wetland management units to provide water delivery and circulation to all areas of the Site. The conveyance channels will provide numerous wetland and wildlife benefits to the project area. Material excavated to construct the channels will provide material for the buttress berm and the interior and perimeter berms. Construction of conveyance channels will convert existing wetland and upland areas into permanent open water that will facilitate water conveyance.

The channels will be managed to encourage the growth of submerged aquatic and floating wetland vegetation and discourage the growth of invasive species. Open water areas will provide waterfowl with areas to land, loaf, and feed. It is anticipated that the presence of permanent open water will increase the amount of waterfowl breeding and brood rearing in the project area.

Conveyance channels will have an approximately 15-ft wide bottom with gradual, 5:1 side slopes. Most of the existing agricultural drainage ditches on Sherman Island have rectangular configurations. A gradual channel side slope will allow for easy wildlife movement across the channels while reducing channel erosion by encouraging vegetation growth along the channel's edges. Depth of channel excavation will vary depending on existing topography.

In addition to the channels, larger open water areas will also be created through excavation. These larger open water areas will be connected to the conveyance channels and have the same bottom elevations. They will serve as waterfowl brood rearing areas in the spring and loafing/storm-shelter locations in the winter. Material borrowed from these areas will be incorporated into the interior and perimeter berms or used to construct loafing islands.

As part of creating varying topography and diverse emergent wetland vegetation communities within the project area, loafing islands will be established in multiple locations. Loafing islands will vary in size and shape. The subtle change in micro-topography as a result of the loafing islands will create habitat diversity and greater hydro-geomorphic interspersion.

Water to the site will be delivered by existing gravity siphons along the San Joaquin River Levee. At this time it is anticipated that siphons 1, 2, 3 and 4 (as shown in figure 2) will be utilized as the primary source of water. Siphon 1 is a 14 inch pipe that is capable of discharging approximately 3000-3500 gallons per minute. Siphon 2 is a 12 inch pipe that is capable of discharging approximately 2500-3000 gallons per minute. Siphon 3 is a 12 inch pipe that is capable of discharging approximately 2500-3000 gallons per minute. Siphon 4 is a 10 inch pipe that is capable of discharging approximately 1750-2200 gallons per minute. Water will be conveyed within the wetland system via gravity flow from the higher elevation units to the lower elevation units until it finally makes its way back to the District's drainage canal at the eastern boundary of the Project.

Improvements to the outlet of the functional siphon may include replacing outlet valves, installing flow meters, and installing additional appurtenances as needed to improve the control of the water supply to the Site. All siphon improvements will take place on the interior (land) side of the San Joaquin River levee. Water delivered to the Site will circulate through the system to maintain appropriate water quality conditions and prevent stagnation and maintain appropriate salinity levels.

Several existing agricultural drainage ditches occur within the interior and exterior of the Site. These ditches connect to the master drainage system of the western portion of Sherman Island. The drainage ditches within the proposed project boundaries will be incorporated into the internal water conveyance system (swale system). A ditch along the exterior perimeter on the western, northern and southern sides of the restoration area will be constructed to ensure drainage from the surrounding landscape, and will include proper drainage for the District's toe ditches.

Construction of the Project will involve stabilizing an historic scour pond located near the southeast project boundary. As discussed above in the Project Background, the second element of the Project will be to fill in the scour pond. Since the levee break that created the pond, the levee has been repaired and the scour pond has remained. In order to maintain long term levee integrity, the Project will restore this area into a habitat transition berm. The scour pond area will transition from maintained levee to native upland habitat to emergent marsh. It is anticipated that the scour pond location will continue to seep water; however, it is not anticipated that the total seepage from this area will be enough to support all the

hydrology requirements of the larger connected wetland unit. Therefore, for the scour pond unit (5A) subsurface water is anticipated to be augmented with additional water from adjacent siphon(s). The vegetation component of the transition berm and emergent wetland will feature native vegetation plantings.

Construction Schedule and Methods

Construction activities will be performed during the dry season between May 2014 and October 15, 2014, and if necessary between May 2015 and October 15, 2015. Earth moving activities will be performed by a licensed contractor and will use agricultural scrapers to transport soils during the excavation of swales and open water areas to construct the Site's interior and perimeter berms as well as loafing islands. Excavators will be used to create ditches and install piping.

Delta islands have extensive peat soils that retain groundwater. A field investigation during the height of the irrigation season revealed an elevated water table and saturated soils throughout the Site. This was largely due to extensive flood irrigation activities in the adjacent fields and high water in the perimeter ditches.

Construction will require that the water table be as low as possible. Initial site preparation includes the dewatering of ditches in order to dry soils for construction, where feasible. This will be accomplished by ensuring that the interior agricultural ditches are clean and flowing freely to the District's drainage canal. The District's main discharge pump may also need to be adjusted to keep the main drainage ditch water level lower than normal.

Initial site preparation for the Project will include removal of vegetation, and especially invasive weeds. This site preparation will take place in areas where swales and ponds will be excavated and used as a source for borrow material necessary to construct the berms. Additionally, the areas that will be the foundation for berm construction will also be scraped to bare earth minimizing the plant material within the levee that would compromise the permeability of the berms.

The Project Site is completely enclosed by a perimeter berm that will prevent any discharge of storm runoff. Construction staging will take place on the southeast end of the Project Site, on the upland area adjacent to the dredge spoil site (Figure 2). Best management practices (BMPs) for erosion control and hazardous materials handling will be implemented during construction. Any spills of hazardous materials will be cleaned up immediately and reported to the responsible resource agencies within 24 hours. Any such spills, and the success of the cleanup efforts, shall also be reported in post-construction compliance reports. Measures will be taken to minimize windborne transport of fine particles to adjacent areas.

Construction of scour pond area may take more than one construction season to allow for water and special status species displacement into suitable habitat in the newly constructed wetlands or elsewhere.

Natural Resources and Management

Management of the Site will have two goals: to maintain permanently flooded emergent wetlands to reverse subsidence, and to provide permanent wetland and upland habitat for a diverse range of wildlife. The Habitat and Water Management Plan is included as Appendix E.

Existing Habitat Conditions

Existing habitat conditions on the site are included in the Wetland Delineation Report (Sherman Island Whale's Mouth Wetland Delineation Report, Ducks Unlimited 2013) and the Botanical Assessment and Protocol-level Rare Plant Survey (WRA 2013, Appendix B).

Desired Habitat Conditions

The desired habitat conditions include a restored wetland with permanently flooded emergent vegetation dominated by hard stem bulrush and cattails with a diverse mosaic of associated upland habitat types. Berms will attain a cover of grasses with shrubs and trees planted on the berm slopes, which will be maintained for site access. Upland habitat restoration areas will be planted in a diverse complex of shrubs, trees, and grassland, which will provide valuable ecological complexity. All habitat areas will be designed to maximize habitat value while minimizing the maintenance required to manage for invasive weeds.

Consultation with the Sacramento Yolo Mosquito and Vector Control District (SYMVCD) has been initiated and preliminary design review has taken place. Additional consultations with SWMVCD and incorporation of design recommendations will ensure water flow and water levels criteria for mosquito control will be realized. This collaboration will allow the Vector Control District to implement a wide variety of effective mosquito control options, if they become necessary. Mosquito control best management practices (BMPs) as identified in the Central Valley Joint Venture "Technical Guide to Best Management Practices for Mosquito Control in Managed Wetlands" (Kwansy et al. 2004), have been incorporated into the engineering design as well as the Habitat and Water Management Plan (Appendix E).

Water Use

As discussed above, water to the site will be provided by four existing gravity siphons along the San Joaquin River/Mayberry Slough Levee to the south of the Project Site that have fish screens maintained by DWR. Water will be conveyed within the wetland system via gravity flow from the higher elevation units to the lower elevation units until it finally makes its way back to the District's drainage canal located to the east of the Project Site.

A Habitat and Water Management Plan (Appendix E) was prepared that includes a complete water budget for the Site. As water levels will remain fairly constant throughout the year, the Site is expected to divert less water from the San Joaquin River on an annual basis than the existing irrigated agricultural uses. It is anticipated that drainage water will be used during the winter to slowly fill the wetlands until an initial average operating level of approximately 1.5 feet is achieved. This initial water level will be maintained during the first full year to ensure that bank erosion due to wave wash does not occur prior to emergent vegetation establishment. Water will then slowly be added over the following late winter and early spring, again from District drainage, to increase the average operating level to approximately 2.5 feet, which will be the optimal average operating water level.

Maintenance of water levels throughout the year will require only minimal water withdraws from the San Joaquin River to balance evapotranspiration. Summertime flow rates during the hottest times of the year may require daily application flows of approximately 5000 gpm, while winter time flows will require minimal if any water application.

9. Surrounding land uses and setting: Briefly describe the Project's surroundings:

The Project Site is located on the west end of Sherman Island near the confluence of the San Joaquin River and Sacramento River. The Site is located at the southern boundary of Sacramento County in the Sacramento-San Joaquin River Delta. Solano County is located approximately 1 mile to the north across the Sacramento River and Contra Costa County is located across the San Joaquin River to the south.

Approximately 90% of Sherman Island, including the Project Site, is owned by DWR. Land uses in the vicinity of the site are primarily agricultural and recreational.

10. Other public agencies whose approval is required (e.g., permits, financing approval, or participation agreement).

Approving Agency	Required Permits and Applications
Federal Agencies	
U.S. Army Corps of Engineers (Corps)	Nationwide Section 404 Discharge Permit. (Clean Water Act, 33 USC 1341)
U.S. Fish and Wildlife Service (USFWS)	Section 7 Consultation
State Agencies	
State Water Resources Control Board, Regional Water Quality Control Board	(Possible) National Pollutant Discharge Elimination System General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activity State Water Resources Control Board Order No. 2009-0009-DWQ as amended by 2010-0014-DWQ Water Quality Certification (Clean Water Act) Section 401
Department of Fish & Wildlife	Environmental Review and Approval Streambed Alteration Section 1600

Figure 1. Project Location

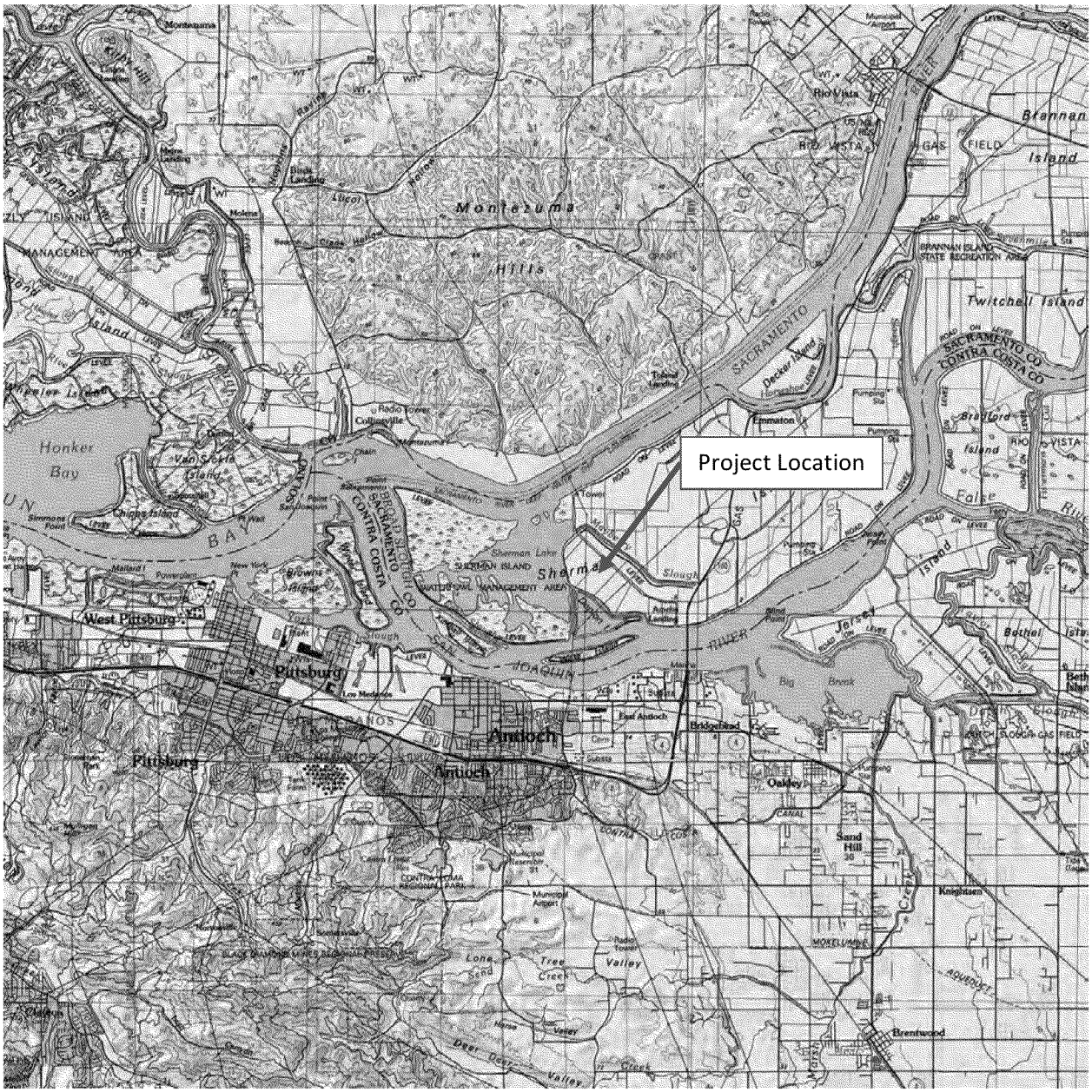

Figure 2. Infrastructure Map

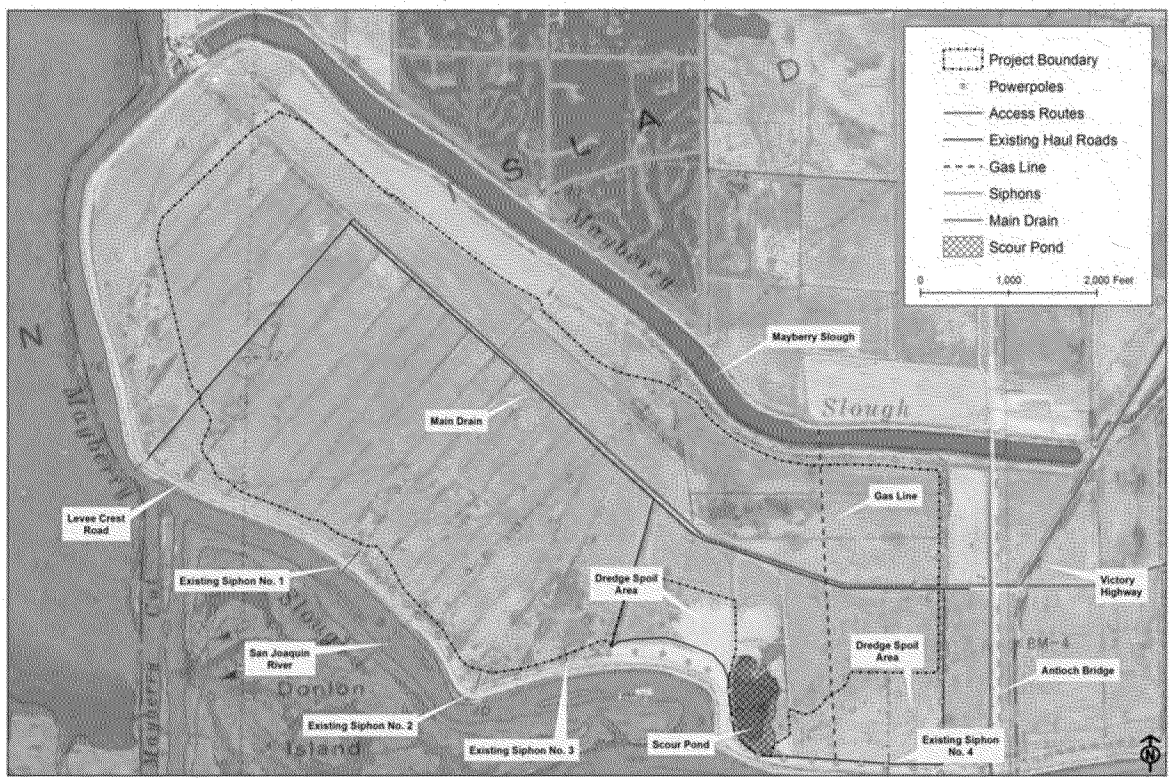

Figure 3. Restoration Plan Map

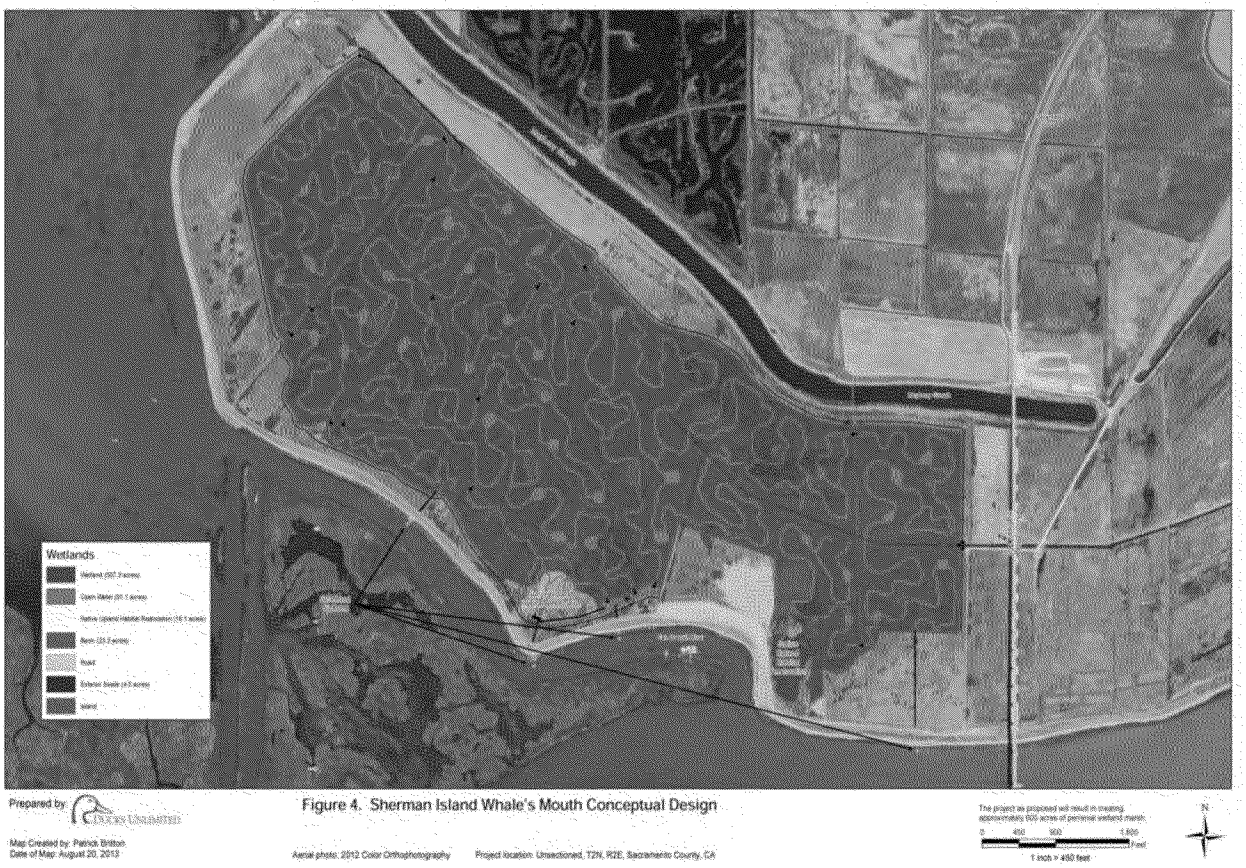

Figure 4. Sherman Island Whale's Mouth Conceptual Design

Figure 4. Typical Cross Sections

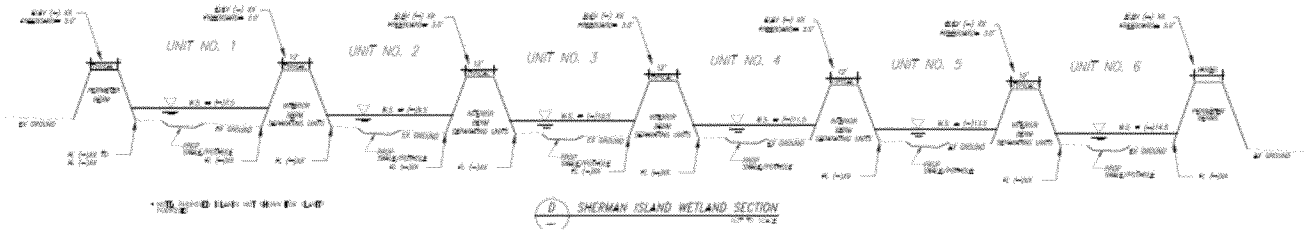

Figure 5. Biological Communities Map (WRA 2013)

ENVIRONMENTAL FACTORS POTENTIALLY AFFECTED:

The environmental factors checked below would be potentially affected by this project, involving at least one impact that is a "Potentially Significant Impact" as indicated by the checklist on the following pages.

☐ Aesthetics	☐ Agriculture Resources	☐ Air Quality
☐ Biological Resources	☐ Cultural Resources	☐ Geology /Soils
☐ Hazards & Hazardous Materials	☐ Hydrology / Water Quality	☐ Land Use / Planning
☐ Mineral Resources	☐ Noise	☐ Population / Housing
☐ Public Services	☐ Recreation	☐ Transportation/Traffic
☐ Utilities / Service Systems	☐ Mandatory Findings of Significance	

DETERMINATION:
On the basis of this initial evaluation:

☐	I find that the proposed project COULD NOT have a significant effect on the environment, and a NEGATIVE DECLARATION will be prepared.
☒	I find that although the proposed project could have a significant effect on the environment, there will not be a significant effect in this case because revisions in the project have been made by or agreed to by the project proponent. A MITIGATED NEGATIVE DECLARATION will be prepared.
☐	I find that the proposed project MAY have a significant effect on the environment, and an ENVIRONMENTAL IMPACT REPORT is required.
☐	I find that the proposed project MAY have a "potentially significant impact" or "potentially significant unless mitigated" impact on the environment, but at least one effect 1) has been adequately analyzed in an earlier document pursuant to applicable legal standards, and 2) has been addressed by mitigation measures based on the earlier analysis as described on attached sheets. An ENVIRONMENTAL IMPACT REPORT is required, but it must analyze only the effects that remain to be addressed.
☐	I find that although the proposed project could have a significant effect on the environment, because all potentially significant effects (a) have been analyzed adequately in an earlier EIR or NEGATIVE DECLARATION pursuant to applicable standards, and (b) have been avoided or mitigated pursuant to that earlier EIR or NEGATIVE DECLARATION, including revisions or mitigation measures that are imposed upon the proposed project, nothing further is required.

_____ _____
Signature Date

_____ _____
Printed Name Title

EVALUATION OF ENVIRONMENTAL IMPACTS:

1) A brief explanation is required for all answers except "No Impact" answers that are adequately supported by the information sources a lead agency cites in the parentheses following each question. A "No Impact" answer is adequately supported if the referenced information sources show that the impact simply does not apply to projects like the one involved (e.g., the project falls outside a fault rupture zone). A "No Impact" answer should be explained where it is based on project-specific factors as well as general standards (e.g., the project will not expose sensitive receptors to pollutants, based on a project-specific screening analysis).
2) All answers must take account of the whole action involved, including off-site as well as on-site, cumulative as well as project-level, indirect as well as direct, and construction as well as operational impacts.
3) Once the lead agency has determined that a particular physical impact may occur, then the checklist answers must indicate whether the impact is potentially significant, less than significant with mitigation, or less than significant. "Potentially Significant Impact" is appropriate if there is substantial evidence that an effect may be significant. If there are one or more "Potentially Significant Impact" entries when the determination is made, an EIR is required.
4) "Negative Declaration: Less Than Significant With Mitigation Incorporated" applies where the incorporation of mitigation measures has reduced an effect from "Potentially Significant Impact" to a "Less Than Significant Impact." The lead agency must describe the mitigation measures, and briefly explain how they reduce the effect to a less than significant level (mitigation measures from Section XVII, "Earlier Analyses," may be cross-referenced).
5) Earlier analyses may be used where, pursuant to the tiering, program EIR, or other CEQA process, an effect has been adequately analyzed in an earlier EIR or negative declaration. Section 15063(c)(3)(D). In this case, a brief discussion should identify the following:
    a) Earlier Analysis Used. Identify and state where they are available for review.
    b) Impacts Adequately Addressed. Identify which effects from the above checklist were within the scope of and adequately analyzed in an earlier document pursuant to applicable legal standards, and state whether such effects were addressed by mitigation measures based on the earlier analysis.
    c) Mitigation Measures. For effects that are "Less than Significant with Mitigation Measures Incorporated," describe the mitigation measures which were incorporated or refined from the earlier document and the extent to which they address site-specific conditions for the project.
6) Lead agencies are encouraged to incorporate into the checklist references to information sources for potential impacts (e.g., general plans, zoning ordinances). Reference to a previously prepared or outside document should, where appropriate, include a reference to the page or pages where the statement is substantiated.
7) Supporting Information Sources: A source list should be attached, and other sources used or individuals contacted should be cited in the discussion.
8) This is only a suggested form, and lead agencies are free to use different formats; however, lead agencies should normally address the questions from this checklist that are relevant to a project's environmental effects in whatever format is selected.
9) The explanation of each issue should identify:
    a) The significance criteria or threshold, if any, used to evaluate each question; and
    b) The mitigation measure identified, if any, to reduce the impact to less than significance.

Project Title: Sherman Island Whales Mouth Wetland Restoration Project

Project Description: The Sherman Island Whales Mouth Wetland Restoration Project will restore approximately 600 acres of palustrine emergent wetlands on a nearly 975-acre parcel that is owned by the California Department of Water Resources.

Environmental Checklist and Discussion

1. AESTHETICS	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect on a scenic vista?	☐	☐	☐	☑
b) Substantially damage scenic resources, including, but not limited to, trees, rock outcroppings, and historic buildings within a state scenic highway?	☐	☐	☐	☑
c) Substantially degrade the existing visual character or quality of the site and its surroundings?	☐	☐	☐	☑
d) Create a new source of substantial light or glare which would adversely affect day or nighttime views in the area?	☐	☐	☐	☑

Response:

a. The Project Site is located on the landward side of a portion of the levee system that surrounds Sherman Island. The elevation of the levee is approximately 10 feet above sea level. Elevation at the Project Site is approximately 9-16 feet below sea level. Therefore, the Project Site is only visible from the levee or the immediately surrounding area. The Project Site is currently being used for agriculture and pasture for grazing. Some of the land is fallow. Thus, there will be little different from the existing uses to the proposed uses and there will be no impact to a scenic vista.

b. The nearest state designated scenic highway is Highway 160, which is located more than 500 feet to the east of the Project Site. The Project Site is only visible while driving on the Antioch Bridge. Since there are no scenic values at the existing site, no loss of scenic values could reasonably be expected.

c. The Project Site will not substantially degrade the existing visual character or quality of the site or its surroundings because the site is currently irrigated agriculture or pasture. The Project will merely be irrigating a wetland instead of commercial crops.

d. No lighting is proposed for the Project. No impact would occur.

2. AGRICULTURE RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
In determining whether impacts to agricultural resources are significant environmental effects, lead agencies may refer to the California Agricultural Land Evaluation and Site Assessment Model (1997) prepared by the California Dept. of Conservation as an optional model to use in assessing impacts on agriculture and farmland. Would the project:				
a) Convert Prime Farmland, Unique Farmland, or Farmland of Statewide Importance (Farmland), as shown on the maps prepared pursuant to the Farmland Mapping and Monitoring Program of the California Resources Agency, to non-agricultural use?	☐	☐	☐	☑
b) Conflict with existing zoning for agricultural use, or a Williamson Act contract?	☐	☐	☐	☑
c) Involve other changes in the existing environment which, due to their location or nature, could result in conversion of Farmland, to non-agricultural use?	☐	☐	☐	☑

Response:
For background purposes, it is important to note that islands within the Sacramento-San Joaquin Delta originally were surrounded by natural levees formed by sediments deposited during spring floods that were stabilized by vegetation. The peat soils were formed from tules and reed vegetation over thousands of years. Beginning in the late 1850s, the natural vegetation was cleared and levees were built to create the farmland. Semi-continuous pumps were used to remove agricultural drainage and maintain a low water table. Over the years, the highly organic peat soils have dried, been subject to wind erosion, compaction, and oxidation (conversion to CO2). As peat soils decompose, the land subsides (Fleck et al. 2007). As a result of nearly 150 years of farming practices, sub-surface irrigation, and exposure of soils to air, the Project Site has subsided approximately 9 to 16 ft below sea level.

a. Conventional farming practices over the past several decades on Sherman Island has resulted in extensive subsidence of the peat soils with some elevations on the island now nearly 30 feet (NAVD 88) below sea level. Because Sherman Island is located in the Western Delta, at the confluence of the Sacramento-San Joaquin Rivers, it is strategically important for protecting the water quality of the Delta. Hence the concomitant need to end land subsiding practices – including, in some cases, conventional agriculture such as grazing – and implement land use practices which accrete soil and reverse subsidence. The proposed Project will accomplish those goals while continuing to provide the existing recreational

opportunities of the Site. Accretion of soil on the interior of Sherman Island may (over several years) in turn reduce the risk of flooding on Sherman Island. This subsidence reversal may support some on-going, appropriate agricultural activities The heavily subsided location and high water table makes the Site unsustainable for agricultural crop production. Thus, most of the Site is managed for grazing or agriculture on short-term leases. For these reasons, the entire Project Site is mapped as Farmland of Local Importance by the Department of Conservation (2010), rather than any form of prime or important farmland.

Therefore, the Project would have no impact on agricultural resources.

b. The Project Site is owned by DWR and like the majority of Sherman Island, is not under a Williamson Act contract. In any event, the open space activities proposed would not be incompatible with the agricultural or open space uses as fish and wildlife enhancement and preservation are a compatible land use. The single legal parcel within the Project Site is currently zoned AG-80(F) under the Sacramento County Zoning Ordinance with a minimum parcel size of 80 gross acres. According to the Sacramento County Code, wildlife habitat is an allowable land use under the AG-80 zoning designation. Furthermore, as a State agency, DWR is exempt from local regulation under the doctrine of sovereign immunity.
No impact would occur.

c. Conventional farming practices over the past several decades on Sherman Island has resulted in extensive subsidence of the peat soils with some elevations approaching -30 feet msl. Agricultural production is no longer sustainable on the Project Site without significant public and private expenditures, including levee maintenance, pumping, and other inputs which may further exacerbate subsidence and ultimately, the sustainability of agricultural uses.
This Project is consistent with the 1990 Proposed Wildlife Management Plans developed for Sherman and Twitchell Islands. Those plans and attending environmental documents:

- Emphasize development of wetland and riparian habitats to maximize wildlife benefits;
- Maintain the integrity of the island and reduce the probability of flooding by reducing the rate of soil subsidence that is largely caused by current farming practices; and
- Effectively managing the island for wildlife.

No impact would occur.

3. AIR QUALITY	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Where available, the significance criteria established by the applicable air quality management or air pollution control district may be relied upon to make the following determinations. Would the project:				
a) Conflict with or obstruct implementation of the applicable air quality plan?	☐	☐	☐	☑
b) Violate any air quality standard or contribute substantially to an existing or projected air quality violation?	☐	☐	☐	☑
c) Result in a cumulatively considerable net increase of any criteria pollutant for which the project region is non-attainment under an applicable federal or state ambient air quality standard (including releasing emissions which exceed quantitative thresholds for ozone precursors)?	☐	☐	☐	☑
d) Expose sensitive receptors to substantial pollutant concentrations?	☐	☐	☐	☑
e) Create objectionable odors affecting a substantial number of people?	☐	☐	☐	☑

Response:

Environmental Setting

Sherman Island is situated in southern Sacramento County at the southern end of the Sacramento Valley Air Basin. Moderately high precipitation, frequent strong daytime winds, and the rural location can result in relatively clean air conditions. However, during certain seasons, these conditions can combine to entrain substantial dust (including particulate matter, PM10) from agricultural fields. Existing agricultural activities on Sherman and other Delta islands can periodically influence various non-attainment conditions in the Sacramento Valley Air Basin (and adjacent Air Basins), which include standards for carbon monoxide, hydrogen sulfide, lead, nitrogen dioxide, sulfur dioxide, sulfides, ozone, and PM10.

Discussion

a. The Site is located in the Sacramento Metropolitan Air Quality Management District (SMAQMD). The district is currently a non-attainment area for carbon monoxide (Sacramento urbanized area - Maintenance), ozone, and particulate matter (PM10) (SMAQMD 2012). The California Clean Air Act (CCAA) of 1988 requires non-attainment areas to achieve and maintain the state ambient air quality standards by the earliest practicable date and local air districts to develop plans for attaining the state ozone,

carbon monoxide, sulfur dioxide, and nitrogen dioxide standards. In compliance with the CCAA, the Sacramento Metropolitan Air Quality Management District (SMAQMD) prepared and submitted the 1991 Air Quality Attainment Plan (AQAP) to address Sacramento County's non-attainment status for ozone and carbon monoxide, and although not required, particulate matter (PM10). The 1991 AQAP was designed to make expeditious progress toward attaining the state ozone standard and contained preliminary implementation schedules for control programs on stationary sources, transportation, and indirect sources, and a vehicle/fuels program. Sacramento County has met the ambient air quality standards for sulfur dioxide and nitrogen dioxide. (SMAQMD 2012)

Work proposed in this Project is not in conflict with or would not obstruct implementation of any applicable air quality plan for the Sacramento Valley or the adjacent other Air Basins. While construction equipment emits ozone precursors, such emissions are included in the emission inventory that is the basis for regional air quality plans. Therefore, construction emissions are not expected to impede attainment or maintenance of ozone standards in the area. To avoid any significant impacts, a strict no-idle of heavy equipment policy will be enforced. In addition, to avoid the spreading of substantial dust (PM10) as a result of scraping or grading activities, water trucks will be utilized to keep the soil moist and heavy. Additionally, if wind is forecasted to be greater than 30 miles per hour on a given day, construction work will be postponed in order to avoid the creation of substantial dust (PM10). No impact would occur.

b.-e. – The brief usage of heavy equipment, which operates routinely at the Project Site under most normal circumstances, is not expected to create any additional discernible pollutants or odors. No impact would occur.

4. BIOLOGICAL RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project:				
a) Have a substantial adverse effect, either directly or through habitat modifications, on any species identified as a candidate, sensitive, or special status species in local or regional plans, policies, or regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☑	☐	☐
b) Have a substantial adverse effect on any riparian habitat or other sensitive natural community identified in local or regional plans, policies, regulations, or by the California Department of Fish and Game or U.S. Fish and Wildlife Service?	☐	☐	☑	☐
c) Have a substantial adverse effect on federally protected wetlands as defined by Section 404 of the Clean Water Act (including, but not limited to, marsh, vernal pool, coastal, etc.) through direct removal, filling, hydrological interruption, or other means?	☐	☑	☐	☐
d) Interfere substantially with the movement of any native resident or migratory fish or wildlife species or with established native resident or migratory wildlife corridors, or impede the use of native wildlife nursery sites?	☐	☑	☐	☐
e) Conflict with any local policies or ordinances protecting biological resources, such as a tree preservation policy or ordinance?	☐	☐	☐	☑
f) Conflict with the provisions of an adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan?	☐	☐	☐	☑

Response:

Environmental Setting
The 877 ac Project Site is shown on the Antioch North, CA USGS topographic quadrangle (Figure 1; un-sectionalized portion of Sherman Island). The Site is in the Lower Sacramento Watershed (hydrologic unit code 18020109), and its centroid is the latitude and longitude of the approximate center of the site are 38° 2'29.02" North and 121°46'24.56" West. Elevation on the Site ranges from nine to sixteen ft below sea level. Topography across the Project Site is generally flat.

The Project Site is bordered by Mayberry Slough to the north, agricultural land to the west, Mayberry Slough and the San Joaquin River to the south, and by Sherman Island East Levee Road to the east. The entire Project Site was surveyed for the project as denoted in Table 1 for categorization of biological communities. The Project Site is composed of the ruderal upland, pasture fields and seasonal wetlands, freshwater canals and ditches, freshwater marsh, and Himalayan blackberry patches.

These broad biological community descriptions are defined by species composition and relative abundance. Biological communities and other features on-site are listed in Table 1 and mapped on Figure 5. Wetland and channel features are discussed in more detail in a separate jurisdictional delineation report (Ducks Unlimited 2013).

Vegetation Communities in the Project Site

Table 1. Biological communities and acreages.

Biological Community	Approximate Acreage
Ruderal	87.2
Pasture Fields & Seasonal Wetlands	727.4
Freshwater Canals and Ditches	20.9
Freshwater Marsh	18.6
Himalayan blackberry	23.2
	Total: 877.3

Ruderal Upland Areas - Ruderal upland areas are located throughout the Project Site, and consist of gravel and dirt roads, levees, and laydown areas for farm equipment. The vegetation within these areas is dominated by a mosaic of non-native ruderal and often invasive species, which do not appear to form distinct vegetation alliances as described in Sawyer et al. (2009). Dominant species include stinkwort (*Dittrichia graveolens*), bristly ox-tongue (*Helminthotheca echioides*), prickly lettuce (*Lactuca serriola*), ripgut brome (*Bromus diandrus*), black mustard (*Brassica nigra*), spiny cocklebur (*Xanthium spinosum*), short-podded mustard (*Hirschfeldia incana*), artichoke thistle (*Cynara cardunculus*), sweet fennel (*Foeniculum vulgare*), common reed (*Phragmites australis*), bull mallow (*Malva nicaeenis*), and crab grass (*Digitaria ciliaris*). These areas have very little potential to support special-status plant species due to the degree of disturbance, altered substrate and hydrology, and the density of ruderal vegetation.

Pasture Fields - Pasture fields dominate the Project Site, and contain primarily perennial pepper weed (*Lepidium latifolium*), pickle weed (*Salicornia pacifica*), yellow star thistle (*Centaurea solstitialis*), and poison hemlock (*Conium maculatum*) in various ratios and do not contain distinct vegetation alliances as described in Sawyer et al. (2009). Associated species within pasture fields include rough cocklebur (*Xanthium strumarium*), stinkwort, bull thistle (*Cirsium vulgare*), common brass buttons (*Cotula coronopifolia*), bird's foot trefoil (*Lotus corniculatus*), rabbit's-foot grass (*Polypogon monspeliensis*), and Mediterranean barley (*Hordeum marinum*).The pasture fields within the Project Site provide limited habitat

that would support special-status plant species due to the degree of disturbance and density of invasive plant species.

Freshwater Canals and Ditches - Freshwater canals and ditches located throughout the Project Site were originally constructed to supply water to crops before the land was converted for grazing. Hydrophytic vegetation is present on the banks and within the channels, and includes two vegetation alliances: broadleaf cattail marsh (*Typha latifolia* Herbaceous Alliance) and California tule marsh (*Schoenoplectus californicus* Herbaceous Alliance) (Sawyer et al. 2009). Dominant species include poison hemlock, perennial pepperweed, broadleaf cattail (*Typha latifolia),* California tule (*Schoenoplectus californicus*), hardstem tule (*S. acutus* var. *occidentalis*), fringed willowherb (*Epilobium ciliatum*), Johnson grass (*Sorghum halepense*), hyssop loosestrife (Lythrum hyssopifolium), water grass (*Echinochloa crus-galli*), and common reed (*Phragmites australis*). Canals and ditches contain some limited habitat that could potentially support special-status plant species despite disturbance caused by annual maintenance.

Freshwater Marsh - Freshwater marsh is present in several locations within the Project Site containing Broadleaf Cattail Marsh vegetation alliances (Sawyer et al. 2009). The vegetation is dominated by hydrophytic species including broadleaf cattail, California tule, hardstem tule, fringed willowherb, western goldentop (*Euthamia occidentalis),* Pacific mosquito fern (*Azolla filiculoides*), common duckweed (*Lemna minor*), and floating primrose (*Ludwigia peploides ssp. peploides*). Open water habitat is present adjacent to the these marshes in deeper areas where truly aquatic species (e.g., floating primrose, Pacific mosquito fern, common duckweed) are more prevalent. Freshwater marsh contains sufficient habitat area to support several special-status plant species.

Seasonal Wetlands - Seasonal wetlands are present throughout the Project Site, particularly in depressional areas and adjacent to pasture fields. These wetlands are dominated by hydrophytic species, many of which are weedy non-native species; however, there are no distinct vegetation alliances (Sawyer et al. 2009). Dominant species are a mosaic of hydrophytic species including poison hemlock, perennial pepperweed, bristly ox-tongue, fat hen (*Atriplex prostrata*), brass buttons, rough cocklebur, bird's-foot trefoil, rabbit's-foot grass, spotted lady's-thumb (*Persicaria maculosa*), and Mediterranean barley. Although the seasonal wetlands within the Project Site contain high densities of non-native hydrophytic species, these areas provide habitat sufficient to support several special-status plant species.

Himalayan Blackberry Patches - Large, monotypic patches of Himalayan blackberry (*Rubus* armeniacus) occur throughout the Project Site in sufficient densities to constitute separate habitat, particularly within pasture fields and adjacent to freshwater ditches. These areas provide very little potential to support special-status plant species due to the dense nature of the vegetation.

Determination of Special-Status Species in the Project Site

Data from the California Natural Diversity Database (CNDDB), California Department of Fish and Wildlife (DFW), California Native Plant Society (CNPS), USFWS, and field surveys were used to determine special-status plant species that could occur in the Project Site. Field surveys were conducted to determine whether habitat for special-status animal species identified in the file data is present in the Project Site. Special-status animal species for which suitable habitat is present in the Project Site are listed in Table 2. Special-status fishes are included in this evaluation despite not having habitat on the island interior, because the project relies on the screened diversion of water from the San Joaquin River and Mayberry Slough, which provides habitat for these species.

Special Status Plant Species Site Evaluation - WRA's preliminary review of available resources and databases (CNDDB, CNPS Electronic Inventory, USFWS Species List, CA Consortium of Herbaria) suggested that sixty-seven special-status plant species have been documented within five miles of the Project Site. Of these, the botanical assessment determined that fifteen special-status plants had the potential to occur, with one identifiable during the early season and fourteen identifiable in the late-season (Table 2). The

remaining fifty-two species were determined to have no potential to occur or are unlikely to occur in the Project Site due to the absence of suitable habitat, absence of suitable soil types, absence of associated species outside of the known elevation range, and/or the degree of disturbance present in the Project Site.WRA botanists performed a botanical assessment and protocol-level rare plant surveys at the site during the early (April 30, May 1) and late (July 15-16) blooming season in 2013 (WRA 2013). No special-status plant species were observed during the protocol-level rare plant surveys. A combined total of 114 plant species were observed during the survey, of which forty-two species are native and seventy-two are not native to California. Of the seventy-two non-native species, forty-four are considered to be invasive by the California Invasive Plant Council (Cal-IPC), including seven ranked "high." nineteen ranked "moderate," twelve ranked "limited," and six ranked "assessed."

Special Status Animal Species Site Evaluation - DWR biologists conducted bird and habitat surveys of the Site during the non-breeding- (February 17, 2012; February 14, 2013) and breeding (June 1, 2012; June 5, 2012; July 2, 2013) seasons to evaluate the avian community composition, document the presence of special status bird species and associated habitats, and develop estimates of bird species richness, diversity, and abundance (DWR 2013). DWR will repeat this effort in 2014 and throughout the project's 5-year post-construction monitoring period. Special status avian species are listed in table 2. No suitable habitat was found for the California clapper rail or the California least tern within the Project Site.

Table 2. Special-status species for which suitable habitat occurs in the Project Site.

Special-Status Species	Common Name	Federal Status & other codes [a, b]	State Status [a] & other codes [b]	Source [c]	Habitat Present?[d] / Species Observed ?
Fish					
Acipenser medirostris	Green sturgeon	T, CH	SSC	1	See text.
Hypomesus transpacificus	Delta smelt	T, CH	E	1, 2	See text.
Spirinchus thaleichthys	Longfin smelt	--	T	2	See text.
Oncorhynchus mykiss	Central Valley steelhead Distinct Population Segment (DPS)	T, CH	--	1	See text.
Oncorhynchus tshawytscha	Central Valley spring-run Chinook salmon ESU	T, CH	T	1	See text.
Oncorhynchus tshawytscha	Sacramento River Winter-run Chinook salmon ESU	E, CH	E	1	See text.
Pogonichthys macrolepidotus	Sacramento splittail	--/ --	SSC	2	See text.

Reptiles					
Actinemys marmorata	Western pond turtle	--	SSC	2,3	Yes/ Yes
Thamnophis gigas	Giant garter snake	T	T	1,2	Yes/ No
Birds					
Buteo swainsoni	Swainson's hawk	MBTA	T	2,3	Yes[1]/ Yes[2]
Elanus leucurus	White-tailed kite	MBTA	FP	3	Yes[1]/ Yes
Circus cyaneus	Northern harrier	MBTA	SSC	2,3	Yes[1]/Yes
Lanius ludovicianus	Loggerhead shrike	--	SSC	2,3	Yes/ Yes[2]
Melospiza melodia mailliardi	Modesto song sparrow	--	SSC	2	Yes/No
Migratory Birds & Birds of Prey	Various	MBTA	--	3	Yes/ Yes
Plants			**/CNPS List [b]**		
Brasenia schreberi	Watershield	--	--/2B.3	4	Yes/No
Carex comosa	Bristly sedge	--	--/2B.1	4	Yes/No
Centromadia parryi congdonii	Congdon's tarplant	--	--/1B.1	4	Yes/No
Centromadia parryi parryi	Pappose tarplant	--	--/1B.2	4	Yes/No
Cicuta maculate bolanderi var. *bolanderi*	Bolander's waterhemlock	--	--/2B.1	2,4	Yes/No
Cirsium hydrophilum var. *hydrophilum*	Suisun thistle	FE	--/1B.1	1,4	Yes/No
Hibiscus lasiocarpus occidentalis	Wooly rose-mallow	--	--/1B.2	4	Yes/No
Juglans hindsii	Northern California black walnut	--	--/1B.1	4	Yes/No
Lathyrus jepsonii jepsonii	Delta tule pea	--	--/1B.2	2,4	Yes/No
Potamogeton zosteriformis	Eel-grass pondweed	--	--/2B.2	4	Yes/No
Sagittaria sanfordii	Sanford's arrowhead	--	--/1B.2	4	Yes/No
Scutellaria galericulata	Marsh skullcap	--	--/2B.2	4	Yes/No
Scutellaria lateriflora	Side-flowering (Blue) skullcap	--	--/2B.2	4	Yes/No
Stuckenia filiformis	Slender-leaved pondweed	--	--/2B.2	4	Yes/No
Symphyotrichum lentum	Suisun Marsh aster	--	--/1B.2	2,4	Yes/No

[a] **Listing Status** Federal status determined from USFWS species list (2013). State status determined from DFW (2011a; 2013 b,c). Codes used in table are: **E** = Endangered; **T** = Threatened; **P** = Proposed; **C** = Candidate; **R** = California Rare; * = Possibly extinct.

[b] **Other Codes** Other codes determined from USFWS species list; DFW (2011a,b; 2012 a,b; 2013 a,b) and CNPS (2012, 2013). Codes used in table are as follows: **SSC** = DFW Species of Special Concern; **FP** = DFW Fully Protected; **Prot** = DFW Protected; **CH** = Critical habitat designated; **MBTA** = protected by Migratory Bird Treaty Act

CNPS List (plants only): **1A** = Presumed Extinct in CA; **1B** = Rare or Endangered (R/E) in CA and elsewhere; **2B** = R/E in CA and more common elsewhere

CNPS List Decimal Extensions: .1 = Seriously endangered in California (over 80% of occurrences threatened / high degree and immediacy of threat); **.2** = Fairly endangered in CA (20-80% of occurrences threatened); **.3** = Not very endangered in CA (< 20% of occurrences threatened or no current threats known).

[c] **Sources** **1** = From USFWS letter. **2** = From CNDDB. **3** = Observed by DWR biologists. 4 = CNPS

[d] **Habitat types/Species Observed** 1 = Project Site has foraging habitat, but no nesting habitat; 2 = Observed only during winter survey(s)

Biological Resources Impact Discussion:

a. Less than Significant with Mitigation Incorporation The project should not have a substantial adverse effect, either directly or indirectly, on any species. There are several possible special status species in the area of the Project. Each of these species is listed and discussed below.

Special-Status Animal Species

Western pond turtle (*Actinemys marmorata*)

Preferred habitat for the western pond turtle (WPT) consists of calm waters, such as streams or pools, with vegetated banks and log or rock basking sites; however, they may utilize upland habitat as a refugia from flooding and for nesting as far as 1640 feet away from water (Stanford HCP 2013). Mature gravid females in northern California populations deposit eggs into nests every other year during the summer months. Nests are typically constructed within sandy banks, above the floodplain, and within approximately 1,000 feet from water. Hatching typically occurs in the fall after a three-month incubation period with a 70% success rate. Construction activities occurring in the summer months have the potential to impact nests, or turtles moving between nests and suitable aquatic habitat.

Several turtles were observed within the scour pond during biological surveys of the Site in June 2013 (DWR 2013) and during site visits in April, May and August (personal communication with P. Briton, D.U. 2013). DWR biologists observed four WPT that were resting on earthen or wooden basking structures rising out of the scour pond during a terrestrial and aquatic wildlife survey conducted on August 20, 2013. No WPT were observed in any of the drainage ditches, which tended to have deep, steep banks that limit access, emergent vegetation, and no sign of suitable basking surfaces. The ruderal areas adjacent to the scour pond may provide suitable nesting habitat for WPT; however, this sandy area is located outside of the Project Site. Although nest sites can be very difficult to find, none were observed during the surveys and site visits.

Construction of the proposed project has the potential to impact WPT occurring or moving through the site during construction. Turtles present in ditches or the scour pond at the time of construction are likely to bury themselves in the mud and may be killed. Whenever possible, all ground disturbances will occur in areas that are dry in order to reduce the likelihood of impacting WPT. In an attempt to encourage WPT occurring in

ditches to leave the construction area, all of the drainage ditches that will be disturbed by construction will be drained to the extent feasible for at least 15 days prior to the start of construction. Some of these ditches will be contoured to eliminate their steep banks and to provide transition into the surrounding landscape.
Due to levee stability concerns, a continuous supply of water through levee under seepage, and a high water table, the scour pond fill must be constructed without first draining it down, thereby eliminating the ability to passively relocate WPT in the same manner planned for the ditches. In order to limit impacts to WPT during construction at the scour pond, the Project will rely on pre-construction surveys, and additional methods, such as trapping and relocation and construction avoidance surveys will be performed per DFW's direction.

The proposed project will provide a net increase of several hundred acres of suitable WPT habitat on-site, including numerous basking sites and upland areas suitable for nesting.

Implementation of the following mitigation measures will ensure that potential impacts to WPT are reduced to a less than significant level.

Mitigation Measures 4.a(1)

- A qualified biologist shall conduct a pre-construction survey for western pond turtles no more than 30 days prior to construction in suitable aquatic habitats within the project site. A combination of visual and trapping surveys may be performed with authorization from the DFW. If the species is found near any proposed construction areas, impacts on individuals and their habitat shall be avoided to the extent feasible. If occupied habitat can be avoided, an exclusion zone shall be established around the habitat and temporary plastic fencing shall be installed around the buffer area with "Sensitive Habitat Area" signs posted and clearly visible on the outside of the fence. If avoidance is not possible and the species is determined to be present in work areas, the biologist with approval from DFW may capture turtles prior to construction activities and relocate them to nearby, suitable habitat a minimum of 300 feet from the work area. Exclusion fencing should then be installed if feasible to prevent turtles from reentering the work area. For the duration of work in these areas the biologist should conduct monthly follow-up visits to monitor effectiveness.
- If a WPT nest is found during surveys, the access route and staging area will be located so as to provide a 100-foot buffer around any nest. The 100-foot buffer will be marked with stakes and flagging, and DFW will be consulted on how to proceed.
- Aquatic habitat in drainage ditches that will be disturbed or removed will be dewatered to the extent feasible at least fifteen days prior to the initiation of construction activities, and will be kept dry to the extent feasible until construction within 100 feet of the respective ditch has concluded. Work will be conducted in the dry, as much as is practical. If ditches contain water during construction, additional surveys will be conducted to ensure that no turtles are present in the construction zone.
- A Worker Environmental Awareness Training Program for construction personnel shall be conducted by a DFW-approved biologist for all construction workers, including contractors, prior to the commencement of construction activities.
- Contract and bid specifications will require contractor to implement best management practices (BMPs) to prevent wildlife entanglements in fencing and impacts to water quality in undrained ditches.

Giant garter snake (GGS; *Thamnophis gigas*)

The emergent wetland habitat of the drainage ditches and scour pond provide habitat for GGS on the Site. Wetland habitats are divided into several categories, including perennial herbaceous wetlands associated with the ditches and scour pond, and predominantly ruderal herbaceous wetlands in the wetter portions of the highly grazed pasture fields. Among these, only perennial herbaceous wetlands provide suitable giant garter snake habitat (Hansen, 2009). Perennial herbaceous wetlands are characterized by emergent macrophytes such as tule (*Scirpus acutus*) and cattail (*Typha* sp.), which are characteristic of the marshes and low-gradient streams inhabited by giant garter snakes throughout the Central Valley. Though characterized by dense, brushy growth that may obscure sunlight and limit basking/thermoregulation activities, riparian shrub

wetlands are also associated with seasonal or perennial waters providing potential habitat for giant garter snake. Riparian shrub is characterized by species such as Himalayan blackberry, which is tolerated by giant garter snakes if associated with a clear open-water interface. Both of these suitable habitat types are generally associated with herbaceous ruderal uplands that provide terrestrial refuge. Herbaceous ruderal uplands are typically characterized by grasses and forbs.

Some of the drainage ditches on-site may contain water during the active season of GGS (early spring through mid-fall). The drainage ditches and palustrine emergent wetlands on-site provide adequate emergent, herbaceous wetland vegetation, such as cattails and bulrushes, for escape cover and foraging habitat during the active season. The Site provides adequate openings in waterside vegetation for basking. The only higher elevation uplands on-site are located along the top and sides of the levee surrounding the Project Site. Although no small mammal burrows were observed in these areas, some burrows could be present, hidden under vegetation. GGS were not observed during biological surveys of the Site in June 2012, and June, July, and August 2013. During these field visits the drainage ditches and scour pond contained standing or slow flowing water, and scattered seasonal ponding was present in low-lying areas within the pasture fields during the winter and spring.

Scattered records suggest that giant garter snakes may have occupied the Sacramento-San Joaquin River Delta at one time, but reclamation of wetlands for intense agricultural applications has eliminated most suitable habitat (Hansen 1986). Recent sightings within the Sacramento-San Joaquin Delta are haphazard, and repeated surveys have failed to identify any extant population clusters in the region (Hansen 1986, Patterson and Hansen 2003a, Swaim 2004). Current locality records indicate that within its range, GGS are distributed in thirteen unique population clusters coinciding with historical flood basins, marshes, wetlands, and tributary streams of the Central Valley (Hansen 1980, Brode and Hansen 1992, USFWS 1997, USFWS 1999). These populations are isolated, without protected dispersal corridors to adjacent populations, and are threatened by land use practices and other human activities, including development of wetland and suitable agricultural habitats. The closest CNDDB record for this species is about 0.26 miles east of the Site on along the Highway 16 (CNDDB 2010). The next closest observation is approximately 3.5 miles northeast of the Site along Horseshoe Bend, Sherman Island (CNDDB 1998). Both observations are located on the Jersey Island quad. DWR conducted habitat assessments and trapping surveys for GGS on Twitchell and Sherman Islands in 2009 as part of ongoing planning activities (DWR 2010). The methods employed were designed to assess habitat quality and detect self-sustaining subpopulations of GGS on the islands. The total trapping effort amounted to approximately 14,000 trap days, 2,800 of which were conducted at 16 sites on Sherman Island (five within one mile of the Site) out of twenty total sites. Halstead et. al. (USGS 2011) subsequently published recommendations for detection of GGS presence in low-density areas. Although DWR's methodology was not as robust, no GGS were observed or captured as a result of this effort. According to Laura Patterson, DFW (personal communication) the individual observations on record most likely washed down from upstream areas and are not indicative of a population in the west Delta.

Upon completion of the proposed project, approximately 600 acres of permanently flooded wetlands and other waters of the U.S. will occur on-site. Managed wetlands that provide permanent water with a mixture of open water and emergent marsh adjacent to upland habitat are known to provide high quality habitat for GGS (Halstead et. al 2010, Hansen 2009). The net result of the proposed project will be a substantial increase in area and quality of potential GGS habitat.

AVOIDING AND MINIMIZING TAKE

Certain aspects of the project could result in direct mortality or species take if giant garter snakes do occur in the Project Site. Potential temporary impacts are associated with earth moving activities, reduced habitat due to ditch abandonment or open water relocation, and vehicle traffic on surface roads adjacent to open-water habitat during project construction. Steps will be taken to reduce the risk and/or minimize the likelihood of

species take by following the USFWS standard Minimization and Avoidance Measures as well as direct consultation with USFWS.

Critical habitat for GGS has not been designated. Significant impacts to GGS will be avoided with the implementation of the following mitigation measures

Mitigation Measure 4.a(2)
Although GGS are very unlikely to occur on the Site, the project will require a Section 7 consultation with USFWS. To avoid impacts to the GGS, the Standard Avoidance and Minimization Measures developed by the USFWS (1997) will be implemented during construction, unless otherwise advised by the USFWS. Implementation of these measures will minimize the potential for harm, harassment, and direct mortality of GGS and its habitat on the Site from project-related activities, should any occur near the site during construction. These measures include the following:

- Within the Project Site, aquatic ditch habitat for GGS will be lowered as much as possible and then maintained as low as possible for at least fifteen consecutive days prior to the initiation of construction activities Complete dewatering is likely not possible due to the high water table and continuous levee under seepage on the Project Site. At most 24-hours prior to the commencement of construction activities, the Site shall be surveyed for giant garter snakes by a USFWS-approved biologist. The biologist will provide the USFWS with a written report that adequately documents the monitoring efforts within 24-hours of commencement of construction activities. The Project Site shall be re-inspected by the monitoring biologist whenever a lapse in construction activity of two weeks or greater has occurred.
- A Worker Environmental Awareness Training Program for construction personnel shall be conducted by a USFWS-approved biologist for all construction workers, including contractors, prior to the commencement of construction activities.
- Conducting grading, clearing, grubbing, or other similar construction-related disturbance of suitable upland habitat within 200 feet of suitable aquatic and/or wetland habitat will be conducted during the GGS active period of May 1 to October 1, when GGS are able to avoid or evade construction activities. If it appears that construction activity may go beyond October 1, the project proponents shall contact the USFWS as soon as possible, but not later than September 15 of the year in question, to determine if additional measures are necessary to minimize take. Construction activities within 200 feet from the banks of snake aquatic habitat will be avoided during the snake's inactive season.
- Clearing activities will be confined to the minimum necessary to facilitate construction activities.
- Project-related vehicles will observe a twenty mile-per-hour speed limit within construction areas, except on existing paved roads where they will adhere to the posted speed limits.
- If a snake is encountered during construction activities, all activities will cease and the USFWS will be notified immediately to determine the appropriate procedures related to the collection and relocation of the snake. A report will be submitted to the USFWS and will include the date(s), location(s), habitat description, and any corrective measures taken to protect the snake, within one (1) business day. The applicant is required to report any take of listed species to the USFWS immediately by telephone at 916-930-5603 and by electronic mail or written letter addressed to the Assistant Field Supervisor, ESA/Regulatory Division of the BDFWO, within one (1) working day of the incident.
- Contract and bid specifications will require contractor to implement best management practices (BMPs) to prevent wildlife entanglements in fencing, and impacts to water quality in undrained ditches. These shall include all food-related trash items (e.g., wrappers, cans, bottles, and food scraps) will be disposed of in closed containers and removed at the end of each workday.

Swainson's hawk (*Buteo swainsoni*)

The project will not have impacts on large trees or other potential nesting and roosting locations for Swainson's hawk and other raptors. Foraging habitat includes ruderal vegetation and irrigated pasture (Woodbridge 1998, Estep 1989).

An overwintering Swainson's hawk was observed during the avian and habitat survey of the Site in February 2012, soaring high over the site. This occurrence was transient in nature, and the bird was not observed using the site for foraging. No Swainson's hawks were detected during the 2013 winter survey, nor during spring surveys in 2012 and 2013 (DWR 2012, DWR 2013).

The existing project footprint is considered low quality foraging habitat for Swainson's hawk (e.g.,, irrigated pasture and ruderal lands). Although the acreage of available foraging habitat will decline with project implementation, the Swainson's hawk foraging habitat created by the project will be of higher quality (i.e., native grasses that are not subject to disturbance from agricultural practices on upland habitat areas, berms, and landside levee slopes The Project will be beneficial to foraging Swainson's hawks because it will also provide potential future suitable nesting trees. Impacts to Swainson's hawks will be avoided with the implementation of Mitigation Measure 4.a(3).

White-tailed kite (*Elanus leucurus*)

Foraging habitat occurs on-site, but there are no trees suitable for nesting on the Site, and therefore no nests. White-tailed kite nesting sites are of concern to DFW (2011a). White-tailed kites were observed during winter avian surveys in 2012 and 2013, and one was observed perched on a snag in August 2013 (DWR 2012, 2013). Impacts to white-tailed kite will be avoided with the implementation of Mitigation Measure 4.a3.

Loggerhead shrike (*Lanius ludovicianus*)

The Site provides foraging habitat for this species and the willows trees and Himalayan blackberry shrubs provide loafing habitat. Loggerhead shrike nest sites are of concern to DFW (2011a). Loggerhead shrikes were observed on-site only during winter avian surveys in 2012 and 2013 (DWR 2012, 2013). No nests were observed on the Site. Impacts to loggerhead shrike will be avoided with the implementation of the Mitigation Measure 4.a3.

Modesto song sparrow (*Melospiza melodia mailliardi*)

The Site is located near the distributional limits of Modesto song sparrow, a DFW species of special concern (Shuford and Gardali 2008). The Site likely provides habitat for Modesto song sparrow. Song sparrows were observed at multiple locations throughout the Site during all avian surveys in 2012 and 2013 (DWR 2012, 2013); however, since positive identification of Modesto song sparrow requires physical measurements, their presence was not confirmed. The Modesto population range encompasses the Site including the Central Valley and Sacramento/San Joaquin Delta. Nesting can occur in vegetation adjacent to irrigation canals and hedgerows. A potentially significant impact would occur if an active nest was removed during construction or if construction disturbance caused nest abandonment prior to fledging of the young birds. Construction of the project will likely provide significant habitat resources for this species (Shuford and Gardali 2008). Impacts to Modesto song sparrow will be avoided with the implementation of Mitigation Measure 4.a3.

Migratory Birds & Birds of Prey

The Site provides less than ideal potential nesting habitat for some birds of prey and birds listed by the Migratory Bird Treaty Act (MBTA). The nesting season is generally from February 1 through August 31. An active nest is one which contains eggs or unfledged young. A potentially significant impact would occur if an active nest was removed during construction or if construction disturbance caused nest abandonment prior to fledging of the young birds. Significant impacts to nesting birds will be avoided with the implementation of following mitigation measure. The Site provides foraging habitat for covered species including Swainson's hawk, white-tailed kite, and the northern harrier.

Mitigation Measures 4.a(3)

- If construction is scheduled to begin between February 1 and August 31 then a qualified biologist shall conduct a preconstruction survey for active nests at the construction site and within 0.25 mile of the construction site from publicly accessible areas within 30 days prior to construction. If no active nest of a bird of prey or MBTA bird is found, then no further mitigation measures are necessary.
- If an active nest of a bird of prey or MBTA bird is found, then the biologist shall flag a minimum 250 foot (1320 ft. (0.25 mile) for Swainson's hawk) Environmentally Sensitive Area (ESA) around the nest if the nest is of a bird of prey, and a minimum 100-foot ESA around the nest tree if the nest is of an MBTA bird other than a bird of prey.
- No construction activity shall be allowed in the buffer until the biologist determines that the nest is no longer active, or unless monitoring determines that a smaller buffer will protect the active nest.
- The buffer may be reduced if the biologist monitors the construction activities and determines that no disturbance to the active nest is occurring. The size of suitable buffers depends on the species of bird, the location of the nest relative to the project, project activities during the time the nest is active, and other project specific conditions. Before any work is authorized within a buffer, DFW shall be consulted. If construction is allowed within the buffer, a biologist will be present to monitor nests and will have the authority to halt construction activities within the buffer if the nesting birds show signs of agitation or potential abandonment. Active nests with transportation routes that are within the buffer zone should be monitored for signs of distress, with routes being altered, or implementing other measures to minimize disturbances.

b. **Less than Significant Impact** - Wetlands on-site are sensitive communities and are discussed in Issue c.

c. **Less than Significant with Mitigation Incorporation** - A wetland delineation has been conducted for the Site and a preliminary map has been prepared that demonstrates the presence of approximately 666 acres of waters of the U.S. in the Project Site. The USACE must verify the map prior to construction in order to issue federal permits. The proposed Project will restore and/or enhance approximately 600 acres of emergent wetlands in association with transitional riparian and upland habitats that will benefit migratory birds, giant garter snakes, western pond turtles, and other wildlife species. The project will result in a net increase in the functions and services (values) of mostly marginal wetland habitat on-site and will provide beneficial effects including subsidence reversal and levee stability.

Fill of jurisdictional wetlands for aquatic habitat restoration, establishment, and enhancement activities may be authorized under a Section 404 CWA Nationwide Permit 27 and a Section 401 CWA Water Quality Certification. Significant impacts to wetlands and waters of the U.S. will be avoided with the implementation of the following mitigation measure. Permit applications are proposed to be submitted in November 2013.

Mitigation Measure 4.c.

- Project proponent shall obtain a Section 404 CWA Nationwide Permit and a Section 401 CWA Water Quality Certification for impacts to Corps jurisdictional features. The project proponent shall fulfill the requirements of the permits.

d. **Less than Significant with Mitigation Incorporation** - Construction of the Project may temporarily disrupt movement of native wildlife species that occur on-site during construction. The Project may impact the movement of WPT hatchlings between nest sites on or near the Project Site and existing aquatic habitat. Refer to Mitigation Measure 4.a1.

The proposed project will restore and/or enhance approximately 600 ac of freshwater emergent wetlands that will provide improved functions and services (values) for migratory waterfowl and other wildlife species. Refer to Issue A for mitigation measures that will protect special status animal species.

The Site does not provide habitat for state or federal listed fishes since the project footprint is located on the island interior and does not overlap their respective habitats. Therefore, the proposed project will not substantially interfere with the movement of native resident fish or wildlife. The managed wetlands will source its water needs from four existing screened gravity siphons along Mayberry Slough/San Joaquin River to the south of the Site, and augmented by levee under seepage, agricultural drainage, and a high water table. Since the four diversions are screened to protect Delta fishes, are maintained regularly by the District and DWR, and since construction of the Project will not result in an impact to special status fishes and their habitat in Mayberry Slough and the San Joaquin River.

e. **No Impact** - The Sacramento County Tree Preservation Ordinance (Sacramento County 1981) requires a permit for removal of or impacts to oak trees greater than 6" diameter at breast height (dbh). The project will not conflict with the County's tree preservation ordinance. No impact will occur and no mitigation is necessary.

f. **No Impact** - There is no adopted Habitat Conservation Plan, Natural Community Conservation Plan, or other approved local, regional, or state habitat conservation plan in the vicinity of the Site. No impact to any of these would occur.

5. CULTURAL RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project:				
a) Cause a substantial adverse change in the significance of a historical resource as defined in §15064.5?	☐	☐	☐	☑
b) Cause a substantial adverse change in the significance of an archaeological resources pursuant to §15064.5?	☐	☐	☐	☑
c) Directly or indirectly destroy a unique paleontological resource or site or unique geologic feature?	☐	☐	☐	☑
d) Disturb any human remains, including those interred outside of formal cemeteries?	☐	☐	☑	☐

Environmental Setting:
The Swamp Land Act of 1850 enabled California to reclaim thousands of acres of land, creating the fertile Sacramento River Delta's islands of agricultural fields. Agriculture and recreation have been the primary uses of Sherman Island, typical of the Sacramento Delta region.

Impact Discussion:
a. There are no historical resources as defined in CEQA Guidelines Section 15064.5 in the project area (Tom Origer & Associates 2013) (Appendix C). No impact would occur.

b. There are no archeological resources as defined in CEQA Guidelines Section 15064.5 in the project area (Tom Origer & Associates 2013). No impact would occur.

c. Because of its geologic history, the project area is considered an unlikely environment for the presence of paleontological resources and for unique geologic features (Tom Origer & Associates 2013). No impact would occur.

d. Because the Site was historically seasonally flooded, it is unlikely that the site was used for interment by natives or early settlers. The potential for disturbance to human remains is considered less than significant. If any historical or cultural resources are discovered during the construction process, all construction shall cease until a qualified professional evaluates the resource.

6. GEOLOGY AND SOILS	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project:				
a) Expose people or structures to potential substantial adverse effects, including the risk of loss, injury, or death involving:	☐	☐	☐	☑
i) Rupture of a known earthquake fault, as delineated on the most recent Alquist-Priolo Earthquake Fault Zoning Map issued by the State Geologist for the area or based on other substantial evidence of a known fault? Refer to Division of Mines and Geology Special Publication 42.	☐	☐	☐	☑
ii) Strong seismic ground shaking?	☐	☐	☐	☑
iii) Seismic-related ground failure, including liquefaction?	☐	☐	☐	☑
iv) Landslides?	☐	☐	☐	☑
b) Result in substantial soil erosion or the loss of topsoil?	☐	☐	☐	☑
c) Be located on a geologic unit or soil that is unstable, or that would become unstable as a result of the project, and potentially result in on- or off-site landslide, lateral spreading, subsidence, liquefaction or collapse?	☐	☐	☐	☑
d) Be located on expansive soil, as defined in Table 18-1-B of the Uniform Building Code (1994), creating substantial risks to life or property?	☐	☐	☐	☑
e) Have soils incapable of adequately supporting the use of septic tanks or alternative waste water disposal systems where sewers are not available for the disposal of waste water?	☐	☐	☐	☑

Response:

Environmental Setting:
The Delta collects all the freshwater runoff from the Central Valley, which is subject to constant interaction with ocean tidal forces and salt water, and then discharges it toward San Francisco Bay and the Pacific Ocean. The complexity of the Delta is primarily the result of its geologic evolution and a long history of basin subsidence, sediment deposition, biotic activity, and interactions with sea-level changes over the past several million years. At times, the Delta was predominately a freshwater body receiving abundant sediment generated from active glaciations and outwash from the Sierra Nevada; during other periods, mineral sedimentation was limited, and land- and soil-forming processes were dominated by profuse marsh vegetation growth and development of peat soils (EDAW 2007).

Impact Discussion:
a. Although the Site is not in a seismically active area, an earthquake occurring in a nearby seismically active area could make the site vulnerable to levee failure and flooding by liquefaction and settling. The western Delta islands, particularly Sherman Island, is considered to be the most vulnerable to seismic levee failure and would have the greatest salinity intrusion impact on the water supply if they failed. Conversely, long-term restoration of Sherman Island to tidal marsh eases pressure on the levees by raising ground elevations behind the levees and thus, reduces the potential for seawater intrusion impacts in the event of future levee failure (Mount and Twiss 2005).

The proposed project would require the use of personnel and vehicles to construct the restoration project. A small number of people and vehicles would be used intermittently to maintain the wetlands and implement the vector control program. The potential for substantial injury or death would be low, because of the limited number of individuals involved in construction and on-going maintenance of the Project. There are no people or homes in the vicinity of the project. The Project would have a less than significant impact on increasing earthquake-related risks.

The Site is not in an area susceptible to landslides. No impact would occur.

b. The Project involves the creation of permanently flooded areas and emergent wetlands. As a result, the project will not cause a substantial loss of topsoil or erosion. No impact would occur.

c. The proposed Project is not on a geologically unstable soil and does not include structural development. Furthermore, it has been designed to reverse subsidence that has occurred because of past agricultural and land management practices. Studies at a similar project site have shown that surface elevation changes due to accretion ranges from 1.3 - 2.2 inches/year, while surrounding areas used for agriculture continue to subside. No impact would occur.

d. The proposed project is not located on expansive soils and no structures would be constructed. No impact would occur.

e. No septic tanks or waste water systems are proposed or would be required for the proposed project. No impact would occur.

7. GREENHOUSE GAS EMISSIONS	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project:				
a) Generate greenhouse gas emissions, either directly or indirectly, that may have a significant impact on the environment?	☐	☐	☑	☐
b) Conflict with an applicable plan, policy or regulations adopted for the purpose of reducing the emissions of greenhouse gases?	☐	☐	☐	☑

Response:

a. Warming of the climate system is now considered to be unequivocal (IPCC, 2007). Global average surface temperature has increased approximately 1.33 °F over the last one hundred years, with the most severe warming occurring in the most recent decades. Eleven of the twelve years from 1995 to 2006, rank among the twelve warmest years in the instrumental record of global average surface temperature (going back to 1850). Continued warming is projected to increase global average temperature between 2 and 11 °F over the next one hundred years (IPCC, 2007).

The causes of this warming have been identified as both natural processes and as the result of human actions. Increases in greenhouse gas (GHG) concentrations in the Earth's atmosphere are thought to be the main cause of human induced climate change. GHGs naturally trap heat by impeding the exit of solar radiation that has hit the Earth and is reflected back into space. The six principal GHGs of concern are carbon dioxide (CO2), methane (CH4), nitrous oxide (N2O), sulfur hexafluoride (SF6), hydrofluorocarbons, and perfluorocarbons. The scale of this project is relatively small, and much of the work will be done with equipment that operates in these agricultural fields on a near-daily basis. In response to California Assembly Bill 32 (AB 32), the Global Warming Solutions Act of 2006, an estimation of the greenhouse gas (GHG) emissions that will be produced by this project has been developed. The effect of the six principal GHGs of concern are normally reported as "CO_2 equivalents," which is a convention that converts each GHG to an equivalent amount of CO_2, accounting for the varying global warming potential of each gas.

Construction of a farm scale permanent wetland on the western side of Sherman Island would contribute to GHG emissions primarily through the use of diesel-powered construction equipment. The combustion of diesel fuel in off-road construction equipment and on-road vehicles (backhoe, trucks, etc.) would emit greenhouse gases consisting mainly of carbon dioxide (CO_2), along with small amounts of methane (CH_4) and nitrous oxide (N_2O). Over the short term of project construction, this project is expected to generate approximately 1,115 metric tons of CO_2-equivalent emissions, 1,105 metric tons of construction equipment emissions, about 5 metric tons of construction workforce transportation emissions, and about 5 metric tons of construction workforce transportation emissions.

No state or federal agency has yet established significance criteria (thresholds of significance) for GHG or other impacts to global climate change. However, some statewide standards have been established that provide information about the order of magnitude of emissions that might be considered significant. Pursuant to AB 32, the California Air Resources Board (CARB) mandates that only "large" facilities (i.e., stationary, continuous sources of GHG emissions) that generate greater than 25,000 metric tons of CO_2 equivalents (CO_2e) per year report their GHG emissions. In addition, CARB has released a preliminary draft staff proposal that recommends 7,000 metric tons of CO_2e per year be used as the baseline threshold for impacts. It is not the intention of the lead agency to adopt a 25,000 or 7,000 $MTCO_2e$ threshold of significance, but only to provide context to the scale of the emissions from the proposed project. The emissions from the proposed project are three and two orders of magnitude lower than CARB's current reporting level and proposed significance threshold, respectively.

The Project is anticipated to provide climate benefits by sequestering atmospheric carbon dioxide (CO2) that will help provide a net reduction in greenhouse gases (GHGs). Pending the availability of funding, the Project Site will provide the opportunity for researchers to use on-site monitoring and data from applied research sites on Sherman and Twitchell Islands to quantify climate benefits. GHG reductions quantified for the site's permanent water management regime have the potential to be extrapolated to other similar sites throughout the Delta.

There will be approximately 600 acres of restored wetlands on this Sherman Island site. The created wetlands are managed in a manner that sequesters atmospheric carbon.Rates of sequestration and emission from such agriculture practices depend upon many factors, including tule species, depth and duration of inundation, and the age of the wetlands. There are too many variables to accurately estimate the amount of carbon the mature tule fields will sequester, but based on the Department's most current understanding of these systems, the tule fields are anticipated to be a net carbon sink. It is estimated, based on recent research results, that approximately 112 acres of wetlands could sequester the total CO2 produced (1,120 metric tons) during the construction phase of the project in one year's time. (Phillip Williams & Associates, 2009)

Based on the review of the discussed above, this project does not conflict with any statewide or local goals with regard to reduction of GHG and the discharge of greenhouse gases to the atmosphere during and after construction is believed to be less than significant, and no significant negative impact to air quality or climate change is expected.

b. Since scale of this project is relatively small, and much of the work will be done with equipment that operates in these agricultural fields on a near-daily basis. No impact.

Construction Equipment Emissions

Type of Equipment	Maximum Number per Day	Total Operation Days[1]	Total Operation hours[2]	Fuel Consumption Per Hour[3]	Total Fuel Consumption (gal. diesel)	CO_2e/gal Diesel[4]	Total CO_2 Equivelant Emissions (metric tons)
Backhoe	1	60	480	3	1,440	0.010391	14.96
Excavator	1	80	640	5	3,200	0.010391	33.25
Water Truck	3	121	2904	3	8,712	0.010391	90.53
Scraper	8	121	7744	12	92,928	0.010391	965.65
TOTAL					**106,280**		**1,104.40**

[1] A 121-day total construction season is assumed (June 1-October1)

[2] A 8-hour work day is assumed, multiplied by the maximum number per day. This list of equipment is estimated and could change depending on equipment availability.

[3] Caterpillar Performance Handbook. Edition 36

[4] World Resources Institute-Mobile combustion CO2 emissions tool. June 2003 Version 1.2

Construction Workforce Transportation Emissions

Average Number of Workers per Day	Total Number of Workdays	Average Distance Travelled (round trip)	Total Miles Travelled	Average Passenger Vehical Fuel Efficiency[5]	Total Fuel Consumption (gal. gasoline)	CO_2e/gal Gasoline[3]	Total CO_2 Equivelant Emissions (metric tons)
5	121	20	12100	20.8	**581.7**	0.00901	5.2

[5] United States Environmental Protection Agency. 2008. Light-Duty Automotive Technology and Fuel Economy Trends:

Construction Materials Transportation Emissions

Trip Type	Total Number of Trips[6]	Average Trip Distance	Total Miles Travelled	Average Semi-truck Fuel Efficiency	Total Fuel Consumption (gal. diesel)	CO_2e/gal Diesel[3]	Total CO_2 Equivelant Emissions (metric tons)
Delivery	25	120	3000	6	500	0.010391	5.20
Spoils	0	0	0	6	0	0.010391	-
TOTAL					**500.00**		**5.20**

[6] Total Number of Trips determined by estimating the quantity of hydraulic materials (pipe, fittings, joints, water control structures, etc.) that needed to be delivered via semi-truck to the work site (conservative estimate was 25 truck loads).

Operational Emissions

Average Annual Electricity Needed	NA
Average Annual Production Emissions	NA
TOTAL	**0**

Total Greenhouse Gas Emissions	**1,114.8**	**MT CO_2 equivelants**
Construction Equipment Emissions	1,104.4	
Workforce Transportation Emissions	5.2	
Construction Materials Emissions	5.2	
Operational Emissions	-	

8. HAZARDS AND HAZARDOUS MATERIALS	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project:				
a) Create a significant hazard to the public or the environment through the routine transport, use, or disposal of hazardous materials?	☐	☐	☑	☐
b) Create a significant hazard to the public or the environment through reasonably foreseeable upset and accident conditions involving the release of hazardous materials into the environment?	☐	☐	☑	☐
c) Emit hazardous emissions or handle hazardous or acutely hazardous materials, substances, or waste within one-quarter mile of an existing or proposed school?	☐	☐	☐	☑
d) Be located on a site which is included on a list of hazardous materials sites compiled pursuant to Government Code Section 65962.5 and, as a result, would it create a significant hazard to the public or the environment?	☐	☐	☐	☑
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☑
f) For a project within the vicinity of a private airstrip, would the project result in a safety hazard for people residing or working in the project area?	☐	☐	☐	☑
g) Impair implementation of or physically interfere with an adopted emergency response plan or emergency evacuation plan?	☐	☐	☐	☑
h) Expose people or structures to a significant risk of loss, injury or death involving wildland fires, including where wildlands are adjacent to urbanized areas or where residences are intermixed with wildlands?	☐	☐	☐	☑

Response:

a. Management of the wetlands and vector control activities may require the use of herbicides and pesticides (Ducks Unlimited 2008). The transport, use and disposal of herbicides and pesticides will be in compliance with the manufacturers' guidelines and will not create a significant hazard to the public or environment. This impact would be less than significant.

b. The Central Valley Regional Water Quality Control Board (RWQCB) has stated that extensive wetland restoration efforts in the Delta have the potential to increase methylmercury exposure for people and wildlife (California Water Boards 2008). However, this project is not expected to discharge any water from the wetlands into the surrounding waterways. The impact would be less than significant.

c. There are no existing or proposed schools located within one-quarter mile of the Site. No impact would occur.

d. The Project Site is not listed as having hazardous material sites within its boundaries (Department of Toxic Substance Control 2008). No impact would occur.

e. The Project Site is not located within an airport land use plan or within 2 miles of a public airport or public use airport. The closest airport is located approximately 7 miles from the Site. No impact would occur.

f. No private airstrips are within 2 miles of the Project Site. No impact would occur.

g. Activities would not impair implementation of or physically interfere with any emergency response or evacuation plans. Reclamation District 341 does have an emergency response plan in case of high water or flooding, but because the Project is located on land below sea level and not in any evacuation path, no impact could be reasonably expected to occur.
No impact would occur.

h. The perennially flooded conditions of the Site would substantially reduce the potential for any wildland fires to occur. No impact would occur.

9. HYDROLOGY AND WATER QUALITY	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project:				
a) Violate any water quality standards or waste discharge requirements?	☐	☐	☐	☑
b) Substantially deplete groundwater supplies or interfere substantially with groundwater recharge such that there would be a net deficit in aquifer volume or a lowering of the local groundwater table level (e.g., the production rate of pre-existing nearby wells would drop to a level which would not support existing land uses or planned uses for which permits have been granted)?	☐	☐	☐	☑
c) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, in a manner which would result in substantial erosion or siltation on- or off-site?	☐	☐	☑	☐
d) Substantially alter the existing drainage pattern of the site or area, including through the alteration of the course of a stream or river, or substantially increase the rate or amount of surface runoff in a manner which would result in flooding on- or off-site?	☐	☐	☑	☐
e) Create or contribute runoff water which would exceed the capacity of existing or planned stormwater drainage systems or provide substantial additional sources of polluted runoff?	☐	☐	☐	☑
f) Otherwise substantially degrade water quality?	☐	☐	☑	☐
g) Place housing within a 100-year flood hazard area as mapped on a federal Flood Hazard Boundary or Flood Insurance Rate Map or other flood hazard delineation map?	☐	☐	☐	☑

h) Place within a 100-year flood hazard area structures which would impede or redirect flood flows?	☐	☐	☐	☑
i) Expose people or structures to a significant risk of loss, injury or death involving flooding, including flooding as a result of the failure of a levee or dam?	☐	☐	☐	☑
j) [Expose people or structures to] inundation by seiche, tsunami, or mudflow?	☐	☐	☐	☑

Response:

Environmental Setting:
The project involves restoring palustrine emergent wetlands to reverse land subsidence that has been caused by exposure of organic soils to air as a result of farming activities. Through many years of subsidence, the Project Site is located in a basin up to 16 ft below sea level, protected from Delta waters by the levees around Sherman Island. Semi-continuous pumps have historically been used to remove agricultural drainage and maintain a low water table. Upon completion of the project, the wetland will require regular water deliveries, draw downs, and overall management to support the desired vegetation and wildlife communities (USGS 2006).

The Delta serves as a vast drainage area for agricultural and urban runoff. This runoff contains a variety of surplus and residual pesticides and nutrients, in addition to contaminants leached from the soils of specific regions. Drainage from within the Delta contains dissolved organic compounds (DOCs) from the islands' peaty soils, which increase downstream water treatment costs and drinking water quality risks. Sacramento Valley drainage includes mercury and other wastes from historic mining activities, and San Joaquin Valley agricultural drainage includes salts originating in the soils in the Valley's west side and in irrigation water (Lund et al. 2007).

Failure of the levees and the flooding of subsided islands such as Sherman Island, particularly during the spring and summer months, has the potential to significantly degrade Delta water by drawing brackish water into the Delta during rapid flooding of Delta islands, and changing the dynamics of the tides in the west Delta (Mount and Twiss 2005). Controlling and reversing subsidence on these highly subsided delta Islands is seen as a way to reduce the risk of catastrophic levee failure, and therefore reduce the potential of degraded water quality.

Impact Discussion:
a. The Project is designed to retain all water provided to it and not release any water to surrounding water bodies (see discussion below). The proposed project would not generate wastes that would be intentionally discharged to surface waters. No impact would occur.

b. The project would not affect groundwater supplies or interfere with groundwater recharge because the project will not withdraw groundwater. The source of water for the project will be drainage water pulled from with the island's existing drainage canals. No impact would occur.

c. The existing drainage pattern through the site will be substantially altered, but not in a manner that would result in substantial erosion or siltation on- or off-site. The created open water and restored wetlands will be completely enclosed by a berm on the north end of the project and by perimeter berms on the west,

north, and east sides that will prevent discharge of storm runoff. Best management practices for erosion control and hazardous materials handling will be implemented during construction. These activities would have a less than significant impact.

d. The existing drainage pattern through the site will be substantially altered, but not in a manner that would result in (unintended) flooding on- or off-site. The goal of this Project is to flood a portion of Sherman Island and restore several hundred acres of palustrine wetlands; therefore there will be flooding onsite, but certainly not flooding that would be harmful or create any adverse environmental impact. This Project will not alter how runoff is removed from the rest of the island. These activities would have a less than significant impact.

e. The Project would not increase runoff volumes or add substantial pollutants to stormwater flows to the Delta. Small amounts of water, less than current levesl may be discharged from the site at times to maintain salinity levels within freshwater marsh. However, the Project is designed to retain all water provided to it and not release any water to surrounding water bodies. Wetlands provide a natural mechanism to reduce pollutants in stormwater. This impact is less than significant.

f. The Project is designed to retain all water provided to it and not release any water to surrounding water bodies. Nevertheless, land-use change from agriculture to freshwater wetlands on Delta islands may have effects on dissolved organic compounds (DOCs) quantity and quality in drainage waters. Persistent flooding of shallow, oxidized organic soils results in high concentrations of DOCs in drainage water. Natural organic matter in the drinking source water reacts with chlorine, added as a disinfectant, to form carcinogenic compounds that are regulated in drinking water by the Environmental Protection Agency. This issue is of concern in the Delta because water diverted from the Delta supplies drinking water to more than 23 million people (Fleck et al. 2007).

Studies conducted for the Twitchell Island wetlands restoration project found that DOCs from permanently flooded wetlands supporting dense emergent vegetation can be similar in magnitude to the loads produced by agricultural management of similar areas with peat soils. The load was greater upon initial flooding of the wetlands but has decreased over time as the DOC in the shallow soil layer is flushed out in seepage from the wetland. It is assumed that through many years of agricultural practices, DOCs have concentrated a large supply of easily mobilized DOC in the soil. It was found that the increase in loads could be controlled through wetland design and water management that reduces water flow through the shallow soil layer. If the loads from the shallow soil layer can be eliminated through management, the loads from the wetland surface water outlets are comparable to agricultural operations (Fleck et al. 2007).

Since water will be managed year round to minimize the potential of water runoff out the impact from the release of DOCs will be less than significant and much less than existing conditions. Another potential pollutant of concern is methylmercury. As noted above, wetland restoration efforts in the Delta have the potential to increase methylmercury exposure for people and wildlife. In 1990, the RWQCB determined that mercury was impairing beneficial uses of the Delta's waters because fish had elevated levels of mercury that posed a risk for humans and wildlife that consumed the fish (RWQCB 2008). Factors that increase sulfate reduction rates, such as high water temperature and high availability of organic carbon are likely to increase the production of methylmercury (RWQCB 2008). In the Delta, marshes seem to be more significant sites of methylmercury production than open-water sediments (RWQCB 2008). However, USGS and DFG research recently conducted on the Yolo Basin wetlands suggests that the conversion of seasonal to permanent wetlands will reduce methylmercury produced on these lands (USGS, unpublished data).

Furthermore, as discussed above, this Project is designed to retain all water provided to it and not release any water to surrounding water bodies. The goal of the Project is to build and maintain a wetland, therefore discharges will not be necessary or part of the operation procedure. The Site will be a closed system. Any increase in methylmercury will therefore be retained at the Site. Lastly, Sherman Island is located with the

Central Delta Zone identified in the Central Valley Regional Water Quality Control Board's Amendments to the Water Quality Control Plan for the Sacramento River and San Joaquin River Basins for the Control of Methylmercury and Total Mercury in the Sacramento-San Joaquin River Delta Estuary and that this zone is meeting methylmercury water quality objectives (CVRWQCB, 2010).

While the Project will request a 401 Water Quality Certification it is not anticipated that the CVRWQCB will recommend site-specific monitoring for methylmercury. However, any and all 401 Water Quality Certification requirements will be incorporated into the Project and made a material part of the mitigation and monitoring program if required.

Potential impacts from methylmercury will be less than significant.

g. No housing is proposed as part of the proposed project. Therefore, no impact would occur.

h. The project is located within the 100-yr floodplain Zone AE (FEMA 1988), but entirely within flood control levees specifically designed to redirect flood flows. If the flood control levees hold during a flood, the project will have not impact on flood flows. If the flood control levees do not hold, then the small berms used as part of the project will have no effect on the flood flows. The project will improve the existing berms and also includes installation of various water control structures typical of managed wetlands throughout the Central Valley. The water control structures are designed only to regulate water levels within and between units, meandering berms and canals to support the desired vegetation and wildlife communities but no volume loss would occur as these berms would be off-set by cuts. No impact would occur.

i. Continued subsidence of Delta islands combined with a rise in sea level caused by global warming, significantly threatens levee stability in the Delta (Mount and Twiss 2005). Reversing the subsidence would have a net beneficial effect on existing conditions by reducing the potential for levee failure by relieving pressure on the levees. No impact would occur.

j. The project does not increase potentials for inundation by seiche, tsunami, or mudflow. No impact will occur.

10. LAND USE AND PLANNING	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project:				
a) Physically divide an established community?	☐	☐	☐	☑
b) Conflict with any applicable land use plan, policy, or regulation of an agency with jurisdiction over the project (including, but not limited to, the general plan, specific plan, local coastal program, or zoning ordinance) adopted for the purpose of avoiding or mitigating an environmental effect?	☐	☐	☐	☑
c) Conflict with any applicable habitat conservation plan or natural community conservation plan?	☐	☐	☐	☑

Environmental Setting:
The Project is located in southwest Sacramento County. Solano County is located across the Sacramento River to the north and Contra Costa located across the San Joaquin River to the south. Land uses in the immediate vicinity of the site include primarily livestock grazing. The majority of Sherman Island on which the Site is located, is owned by the State Department of Water Resources (DWR).

Impact Discussion:
a. The proposed project would not physically divide an established community as none occur in or immediately adjacent to the Site. No impact would occur.

b. State agencies are exempt (as established by *Hall vs. City of Taft* [1952] 47 Cal.2d177) from complying with local or county plans, policies, or zoning regulations. State agencies however, must comply with state laws and regulations, including CEQA, and in so doing, minimize environmental effects, such as conflicts with local plans and policies intended to protect the environment. For these reasons, DWR takes into account local land use policies and regulations when making land use planning decisions.

The site is located in Sacramento County, so the General Plan for Sacramento County was considered in the development of this project. The 1993 General Plan Land Use Diagram identifies Sherman Island as Agricultural Cropland under the Sacramento County General Plan with a combining designation of Resources Conservation Area (Sacramento County 2008). This designation represents agricultural lands most suitable for intensive agriculture. The designation is generally limited to areas where soils are rated from Class I to Class IV by the Soil Conservation Service, or are classified Prime, Statewide, or Unique significance by the State of California Conservation Department. However, due to continuing subsidence and a high water table, continuing traditional agricultural practices are considered not sustainable and increases the risk of catastrophic levee failure, which would lead to degraded water quality. No impact would occur.

c. There is no applicable habitat conservation plan or natural community conservation plan currently in place. No impact would occur.

11. MINERAL RESOURCES	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project:				
a) Result in the loss of availability of a known mineral resource that would be of value to the region and the residents of the state?	☐	☐	☐	☑
b) Result in the loss of availability of a locally-important mineral resource recovery site delineated on a local general plan, specific plan or other land use plan?	☐	☐	☐	☑

Response:

Environmental Setting:

Mineral resources in Sacramento County include natural gas, petroleum, sand, gravel, clay, gold, silver, peat, topsoil, and lignite. The natural gas production areas of Sacramento County are located mostly in the Delta's Rio Vista Field located approximately 3 miles northeast of the Site (County of Sacramento 2006). Peat is not commercially mined in Sacramento County and no other mineral resources are found in or immediately adjacent to the Site.

Impact Discussion:

a. The proposed project would not compromise the availability of any known mineral resources. While no known natural gas fields occur within the area of the Site, it is possible that the resource does exist within the boundaries of the site. Nevertheless, the ability to extract natural gas would not be compromised by the Project. No impact would occur.

b. The Sacramento County General Plan's Conservation Element indicates that there are no mineral resources located in or immediately adjacent to the Site. No impact would occur.

12. NOISE	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project result in:				
a) Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?	☐	☐	☐	☑
b) Exposure of persons to or generation of excessive groundborne vibration or groundborne noise levels?	☐	☐	☐	☑
c) A substantial permanent increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☑
d) A substantial temporary or periodic increase in ambient noise levels in the project vicinity above levels existing without the project?	☐	☐	☐	☑
e) For a project located within an airport land use plan or, where such a plan has not been adopted, within two miles of a public airport or public use airport, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☑
f) For a project within the vicinity of a private airstrip, would the project expose people residing or working in the project area to excessive noise levels?	☐	☐	☐	☑

Environmental Setting:

The Site is located in a rural area of Sacramento County and the noise environment surrounding the Site is typical of a rural environment. There are no sensitive noise receptors within one mile of the Site. A source of noise that could potentially be heard on-site is traffic on Hwy. 160, approximately 500 ft east of the Site. Noise from Hwy. 160 traffic is audible.

Impact Discussion:

a. Temporary increases in noise levels from existing conditions would result from heavy equipment during construction of conveyance channels, improvements to existing berms, and loafing islands. The

Sacramento County performance standards are based on the type of receptor that would hear the noise. Because no sensitive noise receptors occur within one mile of the Site, no impact would occur.

b. Construction activities will not create excessive groundborne vibrations or groundborne noise levels. Because no sensitive noise receptors occur in or within one mile of the Site, no impact would occur.

c. After construction, periodic monitoring, maintenance, and vector control activities would be conducted. These activities would not result in a substantial permanent increase in ambient noise levels above existing noise levels. No impact would occur.

d. After construction, periodic monitoring, maintenance, and vector control activities would be conducted. These activities would not result in a substantial permanent increase in ambient noise levels above existing noise levels. No impact would occur.

e. The Project is not located within an airport land use plan area or in an area where a plan is being contemplated. The closest airport is ± 7 miles from the Site. No impact would occur.

f. The proposed project would not be located within the vicinity of a private airstrip. No impact would occur.

13. POPULATION AND HOUSING	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project:				
a) Induce substantial population growth in an area, either directly (for example, by proposing new homes and businesses) or indirectly (for example, through extension of roads or other infrastructure)?	☐	☐	☐	☑
b) Displace substantial numbers of existing housing, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☑
c) Displace substantial numbers of people, necessitating the construction of replacement housing elsewhere?	☐	☐	☐	☑

Response:

Environmental Setting:

The Site is located on Twitchell Island in a rural area of Sacramento County. Although there are no residences on-site, several residences occur elsewhere on Twitchell Island on lands not owned by DWR. The area where the Project is proposed to be built was farmed for many years. The only on-site improvements are related to distribution of water for crop irrigation, e.g., ditches and flashboards.

Impact Discussion:

a. The proposed project does not involve construction of any new homes, businesses, roads, or other growth inducing infrastructure. No impact would occur.

b. No demolition of housing would occur as a result of removal activities. The project is located on an uninhabited portion of a mostly uninhabited island. Therefore, displacement of housing would not occur. Indirect impacts on residential areas elsewhere would not be expected to occur. No impact would occur.

c. The proposed project area is located in an area where no housing is currently present. Thus, the Project could not be reasonably expected to displace people or require the construction of housing elsewhere. No impact would occur.

14. PUBLIC SERVICES	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project result in substantial adverse physical impacts associated with the provision of new or physically altered governmental facilities, need for new or physically altered governmental facilities, the construction of which could cause significant environmental impacts, in order to maintain acceptable services ratios, response times or other performance objectives for any of the public services:	☐	☐	☐	☑
Fire protection?	☐	☐	☐	☑
Police protection?	☐	☐	☐	☑
Schools?	☐	☐	☐	☑
Parks?	☐	☐	☐	☑
Other public facilities?	☐	☐	☐	☑

Response:

Environmental Setting:

The Site is located in a rural area of Sacramento County with relatively few public services.

Impact Discussion:

The proposed project would not require additional fire protection. Permanent inundation of wetlands would reduce the potential fire hazard on the site. The proposed project would not require police services. No schools are located in the vicinity of the Site. The proposed project would not lead to population increases in numbers of students. The project is not located near recreational facilities. The activities associated with the subsidence reversal project would not adversely affect public facilities because of the small number of persons and vehicles undertaking these activities and the intermittent nature of the activities. No impact would occur under any of the above circumstances.

15. RECREATION	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Would the project increase the use of existing neighborhood and regional parks or other recreational facilities such that substantial physical deterioration of the facility would occur or be accelerated?	☐	☐	☐	☑
b) Does the project include recreational facilities or require the construction or expansion of recreational facilities which might have an adverse physical effect on the environment?	☐	☐	☑	☐

Response:

Environmental Setting:

Recreational facilities in the vicinity of the Site provide a variety of activities. Recreational demand in the Delta has resulted in development of parks, marinas, launching ramps, and fishing piers.

Impact Discussion:

a. The proposed Project will not affect park use at any neighborhood, regional or other recreational facilities. No impact would occur.

b. The project could result in an increase in recreational hunting because the Site may be used for hunting in the future. Any impact from this speculative possibility would nevertheless be less than significant.

16. TRANSPORTATION / TRAFFIC	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project:				
a) Cause an increase in traffic which is substantial in relation to the existing traffic load and capacity of the street system (i.e., result in a substantial increase in either the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections)?	☐	☐	☐	☑
b) Exceed, either individually or cumulatively, a level of service standard established by the county congestion management agency for designated roads or highways?	☐	☐	☐	☑
c) Result in a change in air traffic patterns, including either an increase in traffic levels or a change in location that results in substantial safety risks?	☐	☐	☐	☑
d) Substantially increase hazards due to a design feature (e.g., sharp curves or dangerous intersections) or incompatible uses (e.g., farm equipment)?	☐	☐	☐	☑
e) Result in inadequate emergency access?	☐	☐	☐	☑
f) Result in inadequate parking capacity?	☐	☐	☐	☑
g) Conflict with adopted policies, plans, or programs supporting alternative transportation (e.g., bus turnouts, bicycle racks)?	☐	☐	☐	☑

Response:

Environmental Setting:

Regional access to the site is via Hwy. 160.

Impact Discussion:

a. The proposed project would not result in a substantial increase in traffic nor have the potential to result in a substantial increase in the number of vehicle trips, the volume to capacity ratio on roads, or congestion at intersections. While during construction various pieces of heavy equipment will be moved

onto the Site, the mobilization and demobilization of this type of heavy equipment is common in the area and would not be expected to result any increase in traffic relative to the amount of traffic experienced during agricultural operations. No impact would occur.

b. The proposed project would generate negligible traffic and as such would not exceed a level of service standard, either individually or cumulatively. No impact would occur.

c. The proposed project will not result in any change in air traffic. No impact would occur.

d. The proposed project would not result in any new road construction and therefore would not present hazards due to a design feature or incompatible uses. No impact would occur.

e. The proposed project would not have the potential to affect emergency access. No impact would occur.

f. The proposed would not affect parking capacity. No impact would occur.

g. The proposed Project would not affect policies with respect to alternative transportation. No impact would occur.

17. UTILITIES AND SERVICE SYSTEMS	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
Would the project:				
a) Exceed wastewater treatment requirements of the applicable Regional Water Quality Control Board?	☐	☐	☐	☑
b) Require or result in the construction of new water or wastewater treatment facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☑
c) Require or result in the construction of new storm water drainage facilities or expansion of existing facilities, the construction of which could cause significant environmental effects?	☐	☐	☐	☑
d) Have sufficient water supplies available to serve the project from existing entitlements and resources, or are new or expanded entitlements needed?	☐	☐	☐	☑
e) Result in a determination by the wastewater treatment provider which services or may serve the project that it has adequate capacity to serve the project's projected demand in addition to the provider's existing commitments?	☐	☐	☐	☑
f) Be served by a landfill with sufficient permitted capacity to accommodate the project's solid waste disposal needs?	☐	☐	☐	☑
g) Comply with federal, state, and local statutes and regulations related to solid waste?	☐	☐	☐	☑

Response:

Environmental Setting:

The Site is located in a rural area and has no urban utilities and services.

Impact Discussion:

a. The project does not require waste water treatment capabilities. No impact would occur.

b. The proposed project does not include structural development that would require water delivery or would generate wastewater. No impact would occur.

c. No development requiring storm drainage facilities would occur as a result of the proposed project. No impact would occur.

d. The Site has been historically operated as irrigated agricultural land. The proposed project will use a large volume of water initially to saturate the wetlands. Following initial inundation of the Site, the project would require less water to maintain water levels in the wetlands than it currently receives for irrigation (HydroFocus 2008). The water required to maintain the proposed wetlands is available through existing entitlements. No impact would occur.

e. The proposed project does not require wastewater treatment services. No impact would occur.

f. The proposed project will not generate solid waste. No impact would occur.

g. The project will not generate solid waste. No impact would occur.

18. MANDATORY FINDINGS OF SIGNIFICANCE	Potentially Significant Impact	Less than Significant with Mitigation Incorporation	Less than Significant Impact	No Impact
a) Does the project have the potential to degrade the quality of the environment, substantially reduce the habitat of a fish or wildlife species, cause a fish or wildlife population to drop below self-sustaining levels, threaten to eliminate a plant or animal community, reduce the number or restrict the range of a rare or endangered plant or animal or eliminate important examples of the major periods of California history or prehistory?	☐	☐	☑	☐
b) Does the project have impacts that are individually limited, but cumulatively considerable? ("Cumulatively considerable" means that the incremental effects of a project are considerable when viewed in connection with the effects of past projects, the effects of other current projects, and the effects of probable future projects.)	☐	☐	☐	☑
c) Does the project have environmental effects which will cause substantial adverse effects on human beings, either directly or indirectly?	☐	☐	☐	☑

Impact Discussion:

a. The purpose of the Project is to reverse land subsidence on a portion of Sherman Island. Implementation of the project will result in wetlands being created thereby increasing the suitable habitat for waterfowl and other wildlife species. No significant environmental or biological resources would be adversely affected. Therefore, the project will not result in a significant impact to the environment.

b. The project would have a de minimis contribution to the effects of other developments. Since all impacts would be less than significant, no significant cumulative impacts would occur.

c. No potentially substantial adverse effects on human beings will occur as a result of the project.

Appendix A

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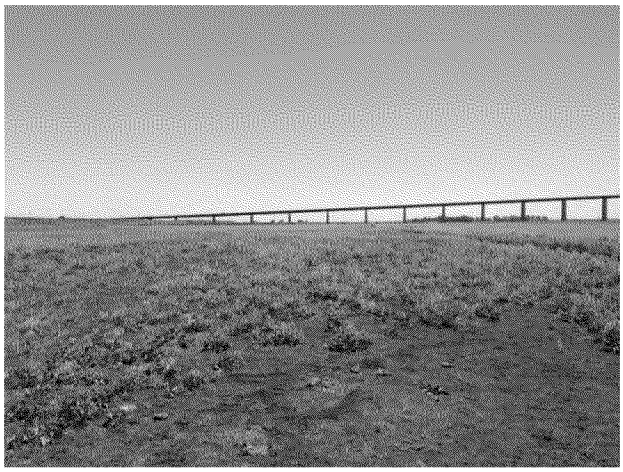
APPENDIX B

WRA Rare Plant Survey Report

Botanical Assessment and Protocol-level Rare Plant Survey

Sherman Island
Sacramento County, California



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July 2013

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Appendix B – Plant Species Observed in the Project Area April 30 – May 1, 2013 and July 15 – 16, 2013
Appendix C – Representative Photographs of the Project Area

1.0 INTRODUCTION

The approximately 877-acre Sherman Island Project site (Project Area), located in Sacramento County, California, is bounded by contiguous agricultural and pasture lands, associated ditches, and rural gravel roads, as well as the outboard levee of Sherman Island. The Project Area vegetation supports ruderal upland areas, pasture fields, freshwater canals and ditches, Himalayan blackberry patches (*Rubus armeniacus*), freshwater marshes, and seasonal wetlands.

The purpose of this document is to describe the methods and results of a botanical assessment and protocol-level rare plant survey conducted by WRA, Inc. (WRA) on April 30 and May 1, 2013 (early-season), and July 15 and 16, 2013 (late-season). Fifteen special-status plants were determined to be potentially present as a result of the botanical assessment, with one identifiable during the early-season survey and 14 identifiable in the late-season survey. The purpose of the survey was to determine the presence/absence of each of the special-status species with the potential to occur within the Project Area.

WRA botanists familiar with the vegetation and special-status plant species habitats in the Sacramento Delta, including Sacramento, Solano, San Joaquin, and Contra Costa counties, conducted the protocol-level rare plant survey. The surveys coincided with the blooming period and/or a period sufficient to accurately identify the 15 special-status plant species with the potential to occur within the Project Area. No special-status plants were observed during the surveys.

1.1 Project Area Description

1.1.1 Vegetation

The Project Area vegetation is composed of ruderal upland areas, pasture fields, freshwater canals and ditches, Himalayan blackberry patches, freshwater marsh areas, and seasonal wetlands containing several vegetation alliances. These habitats are summarized described below.

Ruderal Upland Areas. Ruderal upland areas are located throughout the Project Area and consist of gravel and dirt roads, levees, and laydown areas for farm equipment. The vegetation within these areas is dominated by a mosaic of non-native ruderal and often invasive species, which do not appear to form distinct vegetation alliances as described in Sawyer et al. (2009). Dominant species include stinkwort (*Dittrichia graveolens*), bristly ox-tongue (*Helminthotheca echioides*), prickly lettuce (*Lactuca serriola*), ripgut brome (*Bromus diandrus*), black mustard (*Brassica nigra*), spiny cocklebur (*Xanthium spinosum*), short-podded mustard (*Hirschfeldia incana*), artichoke thistle (*Cynara cardunculus*), sweet fennel (*Foeniculum vulgare*), common reed (*Phragmites australis*), bull mallow (*Malva nicaeenis*), and crab grass (*Digitaria ciliaris*). These areas have very little potential to support special-status plant species due to the degree of disturbance, altered substrate and hydrology, and the density of ruderal vegetation.

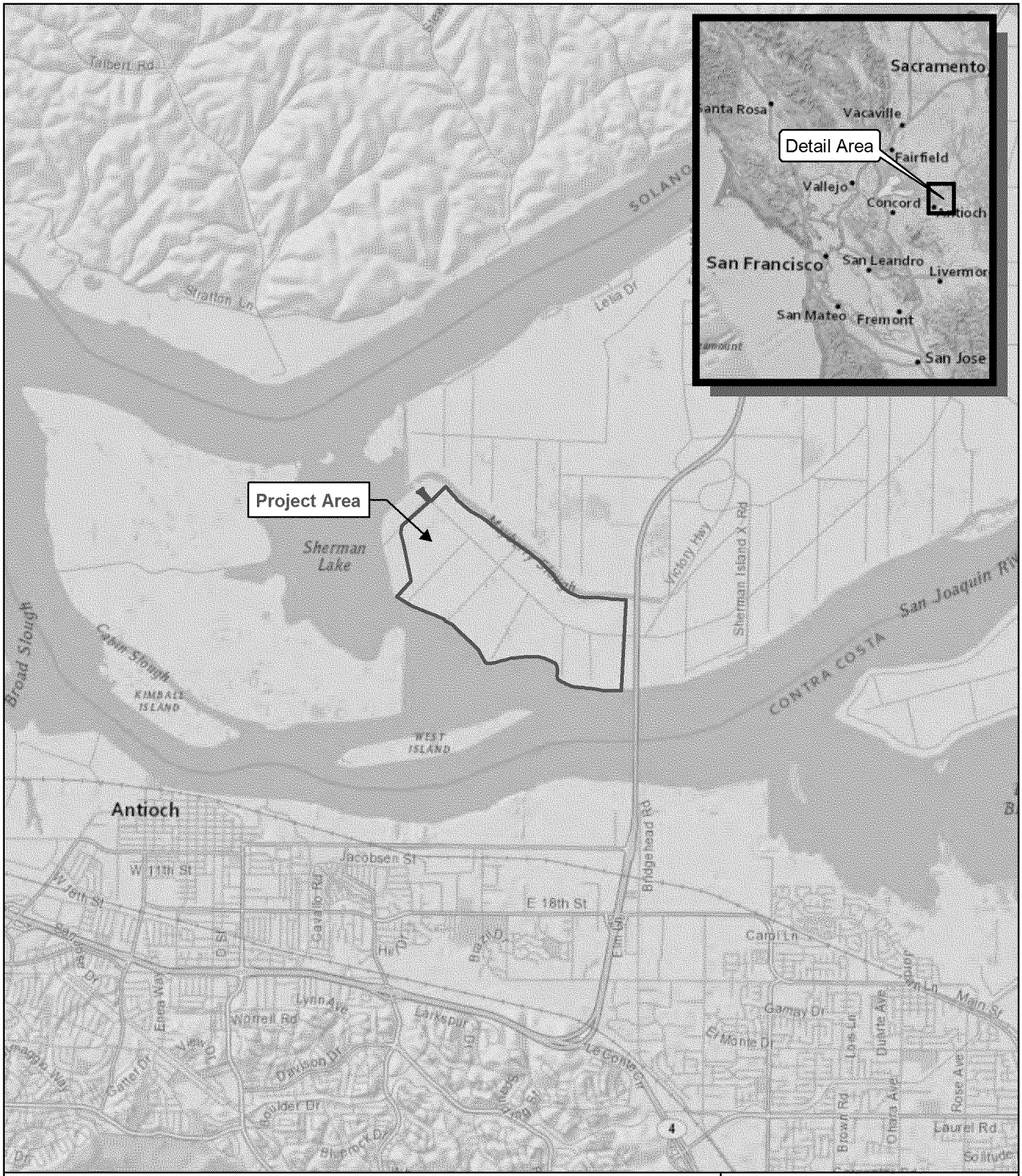

Figure 1. Project Area Location Map

Sherman Island
Sacramento County, California

0 0.25 0.5 1 1.5 2
Miles

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Map Date: July 2013
Map By: Derek Chan
Base Source: ESRI/National Geographic

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Sherman Island

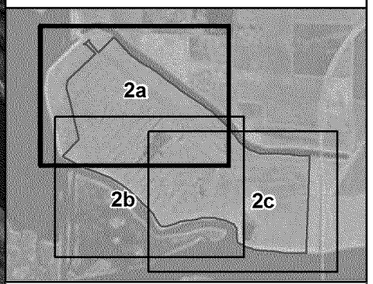
Sacramento County, California

Figure 2a.

Project Area Close-up

Legend

Project Area



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Feet

Map Date: July 2013
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Sherman Island

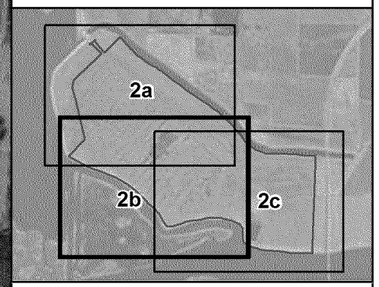
Sacramento County, California

Figure 2b.

Project Area Close-up

Legend

Project Area



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Sherman Island

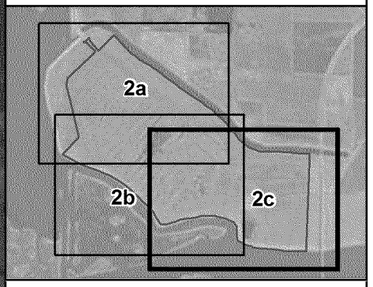
Sacramento County, California

Figure 2c.

Project Area Close-up

Legend

Project Area



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Pasture Fields. Pasture fields dominate the Project Area and consist primarily of perennial pepper weed (*Lepidium latifolium*), perennial pickle weed (*Salicornia pacifica*), yellow star thistle (*Centaurea solstitialis*), and poison hemlock (*Conium maculatum*) in various ratios and do not form distinct vegetation alliances as described in Sawyer et al. (2009). Associated species within the pasture fields include rough cocklebur (*Xanthium strumarium*), stinkwort (*Dittrichia graveolens*), bull thistle (*Cirsium vulgare*), common brass buttons (*Cotula coronopifolia*), bird's-foot trefoil (*Lotus corniculatus*), rabbit's-foot grass (*Polypogon monspeliensis*), and Mediterranean barley (*Hordeum marinum*). The pasture fields with in the Study Area provide limited habitat sufficient to support special-status plant species due to the degree of disturbance and density of invasive plant species.

Freshwater Canals and Ditches. Freshwater canals and ditches are man-made and located throughout the Project Area. These ditches likely supplied water to crops before the land was converted for grazing. Hydrophytic vegetation is present on the banks and within the channels and includes two vegetation alliances: broadleaf cattail marsh (*Typha latifolia* Herbaceous Alliance) and California tule marsh (*Schoenoplectus californicus* Herbaceous Alliance) (Sawyer et al. 2009). Dominant species include poison hemlock (*Conium maculatum*), perennial pepperweed (*Lepidium latifolium*), broadleaf cattail (*Typha latifolia*), California tule (*Schoenoplectus californicus*), hardstem tule (*S. acutus* var. *occidentalis*), fringed willowherb (*Epilobium ciliatum*), Johnson grass, hyssop loosestrife, water grass (*Echinochloa crus-galli*), and common reed (*Phragmites australis*). Canals and ditches provide limited habitat sufficient to support special-status plant species despite disturbance caused by annual maintenance.

Himalayan Blackberry Patches. Large, monotypic patches of Himalayan blackberry occur throughout the Project Area in sufficient densities to constitute separate habitat, particularly within pasture fields and adjacent to freshwater ditches. These areas provide very little potential to support special-status plant species due to the dense nature of the vegetation.

Freshwater Marsh. Freshwater marsh is present in several locations within the Project Area. These marshes contain the vegetation alliances, broadleaf cattail marsh and California tule marsh (Sawyer et al. 2009). The vegetation is dominated by hydrophytic species including broadleaf cattail, California tule, hardstem tule, fringed willowherb, western goldentop (*Euthamia occidentalis*), Pacific mosquito fern (*Azolla filiculoides*), common duckweed (*Lemna minor*), and floating primrose (*Ludwigia peploides* ssp. *peploides*). Open water habitat is present adjacent to the these marshes in deeper areas where truly aquatic species (e.g. floating primrose, Pacific mosquito fern, common duckweed) are more prevalent. Freshwater marsh provides habitat sufficient to support several special-status plant species.

Seasonal Wetlands. Seasonal wetlands are present throughout the Project Area, particularly in depressional areas and adjacent to pasture fields. These wetlands are dominated by hydrophytic species, many of which are weedy non-native species; however, there are no distinct vegetation alliances (Sawyer et al. 2009). Dominant species are a mosaic of hydrophytic species including poison hemlock, perennial pepperweed, bristly ox-tongue, fat hen (*Atriplex prostrata*), brass buttons, rough cocklebur, bird's-foot trefoil, rabbit's-foot grass, spotted lady's-thumb (*Persicaria maculosa*), and Mediterranean barley. Although the seasonal wetlands within the Project Area contain high densities of non-native hydrophytic species, these areas provide habitat sufficient to support several special-status plant species.

2.0 METHODS

2.1 Habitat Assessment

The terms, special-status plant species and rare plant species are used herein synonymously, and are defined here to include: (1) all plants that are federal- or state-listed as rare, threatened or endangered, (2) all federal and state candidates for listing, (3) all plants included in Lists 1 through 2 of the CNPS Inventory (Skinner and Pavlik 2001), and (4) plants that qualify under the definition of "rare" in the California Environmental Quality Act, section 15380.

A background information search was conducted to identify potential special-status plant species that may occur in the vicinity of the Project Area. A table of these species, and their protection status, habitat requirements, and likelihood to occur in the Project Area is provided in Appendix A. Sources for this search included the United States Fish and Wildlife Service (USFWS) Species List for Sacramento County (USFWS 2013), California Consortium of Herbaria (CCH 2013), California Department of Fish and Wildlife (CDFW) Natural Diversity Database (CDFW 2013) records, and the California Native Plant Society (CNPS) Electronic Inventory of Rare and Endangered Vascular Plants of California (CNPS 2013) for the USGS Jersey Island, Birds Landing, Rio Vista, Isleton, Antioch North, Bouldin Island, Antioch South, Bentwood, and Woodward Island 7.5-minute quadrangles.

Based on the results of the background literature search, WRA botanists familiar with the vegetation and special-status plant species of the Sacramento Delta region assessed the Project Area for habitat sufficient to support all special-status plant species documented within the greater vicinity of the Project Area. Prior to the site visit, the assessment was conducted remotely by utilizing the latest aerial photographs, soil maps, the Jersey Island and Antioch North USGS 7.5-minute quadrangles, and the relative location of the nearest documented occurrences of special-status plant species. Species dependent upon habitats with no potential to occur within the Project Area (e.g. coastal scrub, serpentine grassland), were removed from further analysis.

Following the remote assessment, WRA botanists conducted a site visit to further assess the habitats within the Project Area. All special-status plant species documented within the greater vicinity of the Project Area were then assessed based on vegetation communities, soil affinity, associated species, topographic position, shade tolerance, disturbance tolerance, climatic conditions, and population distribution to determine the potential for these species to occur in the Project Area (Appendix A). The potential for each special-status plant species to occur in the Project Area was then evaluated according to the following criteria:

> **Present**: Species is observed on the site or has been recorded (i.e. CNDDB, other reports) on the site recently.
>
> **High Potential**: All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.
>
> **Moderate Potential**: Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.
>
> **Unlikely**: Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found on the site.

No Potential: Habitat on and adjacent to the site is clearly unsuitable for the species requirements (associated species, substrate, elevation, hydrology, plant community, site history, disturbance regime).

2.2 Field Survey

A floristic, protocol-level rare plant survey was conducted across two seasons. Early-season species were surveyed on April 30 and May 1, 2013, and late-season species were surveyed on July 15 and 16, 2013. The surveys corresponded to peak blooming or fruiting periods for observing and accurately identifying hundreds of plant species in the Delta, including the 15 special-status plant species determined to have a moderate or high potential to occur in the Project Area. The field survey was conducted by botanists familiar with the Sacramento Delta region. Where and when possible, WRA consulted with other botanists, reviewed dates of historical documentation, or conducted reference site visits to ensure that the surveys were conducted within a period sufficient to identify the potentially occurring special-status plant species.

The surveys followed the protocol for plant surveys described by Nelson (1987), which complies with recommended resource agency guidelines (CNPS 2001, CDFG 2000, CDFG 2009, USFWS 1996). The Project Area was traversed on foot whereupon each habitat was thoroughly searched and all plant species observed were recorded (Appendix B). All plants were identified using *The Jepson Manual* (Hickman 1993) or *The Jepson Manual, 2nd Edition* (Baldwin et al. 2012) to the taxonomic level necessary to determine whether or not they were rare. Nomenclature follows the Baldwin et al. (2012), the most recent and widely accepted authority on California floristics.

The April 30 and May 1, 2013 surveys focused on the early season species, which consisted only of Northern California black walnut (*Juglans hindsii*).The July 15 and 16, 2013 surveys concentrated on late blooming special-status plant species including watershield (*Brasenia schreberi*), bristly sedge (*Carex comosa*), Congdon's tarplant (*Centromadia parryi* ssp. *congdonii*), pappose tarplant (*C. parryi* ssp. *parryi*), Bolander's hemlock (*Cicuta maculata* var. *bolanderi*), Delta button-celery (*Eryngium racemosum*), woolly rose-mallow (*Hibiscus lasiocarpus* var. *occidentalis*), Delta tule pea (*Lathyrus jepsonii* var. *jepsonii*), eel-grass pondweed (*Potamogeton zosteriformis*), slender-leaved pondweed (*Stuckenia filiformis*), Sanford's arrowhead (*Sagittaria sanfordii*), marsh skullcap (*Scutellaria galericulata*), side-flowering skullcap (*S. lateriflora*), and Suisun Marsh aster (*Symphyotrichum lentum*).

3.0 RESULTS AND DISCUSSION

3.1 Habitat Assessment

Based upon a review of CNDDB (CDFW 2013), CNPS Electronic Inventory (CNPS 2013), USFWS Species List (USFWS 2013), and CCH (2013) resources and databases, 67 special-status plant species have been documented in the greater vicinity of the Project Area; those recorded within a 5-mile radius of the Project Area are illustrated in Figure 3. A table of all 67 special-status plant species, including their habitat requirements, blooming periods, elevation ranges, and status, is provided in Appendix A.

Fifteen species were determined to have a moderate (12) or high (3) potential to occur in the Project Area. The remaining 52 species were determined to have no potential or are unlikely to

occur in the Project Area due to the absence of suitable habitat (e.g. oak woodland), absence of suitable soil types (e.g. serpentine), absence of associated species, outside of the known elevation range, and/or the degree of disturbance present in the Project Area. Of the 15 species with the potential to occur, one is readily identifiable in the early-season (April and May), while 14 are identifiable during the late-season (July).

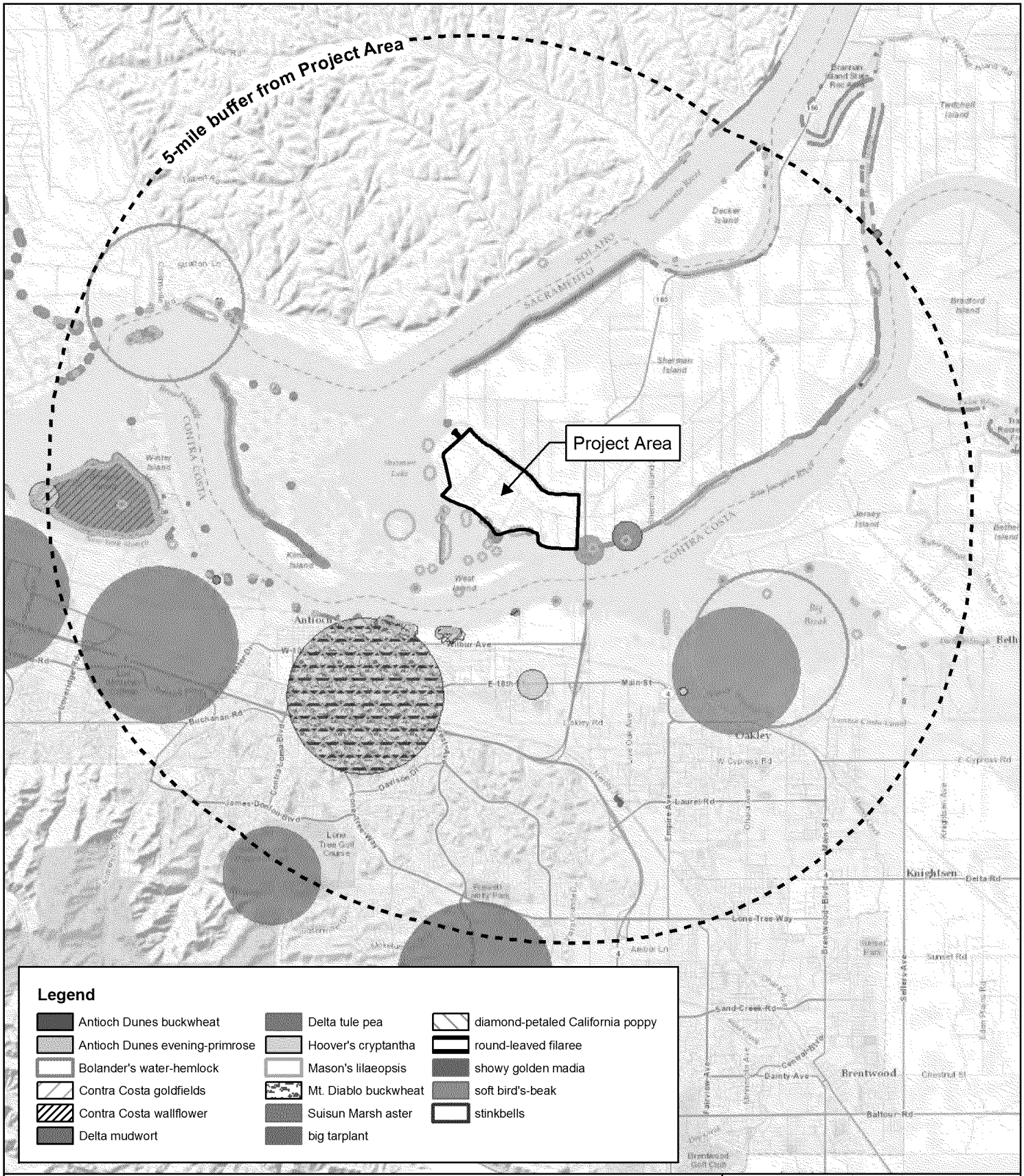

Figure 3. Special Status Plant Species within 5 miles of the Project Area

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Sherman Island
Sacramento County, California

0 1 2 4
Miles

Date: July 2013
Map By: Derek Chan
Map Source: CNDDB

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3.2 Field Survey

No special-status plant species were observed during the protocol-level rare plant surveys conducted in April and July 2013. A combined total of 114 species were observed during the survey, of which 42 species are native and 72 are not native to California. Of the 72 non-native species, 44 are considered by the California Invasive Plant Council (Cal-IPC) to be invasive including seven ranked "high", nineteen ranked "moderate", twelve ranked "limited", and six ranked "assessed" (2006).

4.0 CONCLUSIONS AND RECOMMENDATIONS

WRA botanists familiar with the vegetation and special-status plant species habitats in the Sacramento Delta, including Sacramento, Solano, San Joaquin, and Contra Costa counties, performed a protocol-level rare plant survey for early-season species in April and May 2013 and late-season species in July 2013. Fifteen special-status plant species were determined to have a moderate or high potential to occur within the Project Area. One species was the focus of the early-season survey and 14 species were the focus of the late-season survey. Both survey dates were performed in a period sufficient to identify each species; however, no special-status plant species were observed during either the early-season or late-season survey. Therefore, impacts to special-status plant species are not anticipated within the Project Area.

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APPENDIX A

Potential for Special Status Plant Species to Occur in the Project Area

Table A-1. Potential for Special-status Plant Species to Occur in the Project Area. List compiled from the California Department of Fish and Game (CDFG) Natural Diversity Database (March 2013), U.S. Fish and Wildlife Service (USFWS) Species Lists (March 2013), and California Native Plant Society (CNPS) Electronic Inventory (March 2013) searches of the Isleton, Birds Landing, Rio Vista, Bouldin, Antioch North, Jersey Island, Woodward Island, Antioch South, and Brentwood USGS 7.5' quadrangles.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
PLANTS				
large flowered fiddleneck *Amsinckia grandiflora*	FE; SE; Rank 1B	Cismontane woodland, valley and foothill grassland; located in annual grasslands underlain by a variety of substrates. Elevation range: 890 – 1790 feet. Blooms: April – May.	**No Potential.** The Project Area does not contain woodland or high quality grassland habitat necessary to support this mainland species.	No further actions are recommended for this species.
slender silver moss *Anomobryum julaceum*	Rank 2	Broadleaf upland forest, lower montane coniferous forest, North Coast coniferous forest; grows on damp rocks and soil of low pH (acidic); typically observed on roadcuts. Elevation range: 325 – 3250 feet.	**No Potential.** The Project Area does not contain forest habitat necessary to support this species.	No further actions are recommended for this species.
Mt. Diablo manzanita *Arctostaphylos auriculata*	Rank 1B	Chaparral; located in canyons and slopes underlain by sandstone substrates. Elevation range: 435 – 2115 feet. Blooms: January – March.	**No Potential.** The Project Area does not contain chaparral habitat necessary to support this species.	No further actions are recommended for this species.
Contra Costa manzanita *Arctostaphylos manzanita* ssp. *laevigata*	Rank 1B	Chaparral; located on rocky, often thin soils. Elevation range: 1625 – 3575 feet. Blooms: January – April.	**No Potential.** The Project Area does not contain chaparral habitat necessary to support this species.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
alkali milk-vetch *Astragalus tener* var. *tener*	Rank 1B	Alkali playa, valley and foothill grassland, vernal pools; located in low areas, flats, and pool margins in mesic low-growing grasslands underlain by alkali substrates. Elevation range: 3 – 195 feet. Blooms: March – June.	**Unlikely.** Although the Project Area contains seasonal wetland habitat, this species was unlikely to occur historically on Sherman Island. Additionally, a viable seed source is unlikely to colonize in the current conditions.	No further actions are recommended for this species.
heartscale *Atriplex cordulata* var. *cordulata*	Rank 1B	Chenopod scrub, valley and foothill grassland, meadows; located on alkali flats and scalds in the Great Valley. Elevation range: 0 – 1820 feet. Blooms: April – October.	**Unlikely.** Although the Project Area contains seasonal wetlands and moderate alkali conditions this species was unlikely to occur historically on Sherman Island. Additionally, a viable seed source is unlikely to colonize in the current conditions.	No further actions are recommended for this species.
brittlescale *Atriplex depressa*	Rank 1B	Chenopod scrub, meadows, playas, valley and foothill grassland, vernal pools; typically located in alkali scalds or clay meadows with annual grasses; infrequently associated with marshes or riparian areas. Elevation range: 3 – 1040 feet. Blooms: April – October.	**Unlikely.** Although the Project Area contains seasonal wetlands and moderate alkali conditions this species was unlikely to occur historically on Sherman Island. Additionally, a viable seed source is unlikely to colonize in the current conditions.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
San Joaquin spearscale *Atriplex joaquiniana*	Rank 1B	Chenopod scrub, alkali meadows, valley and foothill grasslands; located in seasonal alkali wetland meadows, alkali sink scrub; associated with salt grass and alkali heath. Elevation range: 3 – 2715 feet. Blooms: April – October.	**Unlikely.** Although the Project Area contains seasonal wetlands and moderate alkali conditions this species was unlikely to occur historically on Sherman Island. Additionally, a viable seed source is unlikely to colonize in the current conditions.	No further actions are recommended for this species.
big tarplant *Blepharizonia plumosa*	Rank 1B	Valley and foothill grassland; located on dry hillslopes and plains in annual grasslands underlain by clay to clay loam substrate; typically located on slopes and/or burned areas. Elevation range: 95 – 1645 feet. Blooms: July – October.	**No Potential.** The Project Area does not contain hillside or canyon grasslands necessary to support this species.	No further actions are recommended for this species.
Watershield *Brasenia schreberi*	Rank 2	Freshwater marshes and swamps Elevation range: 98 – 7150 feet. Blooms: June – September	**Moderate Potential.** Although the Project Area contains freshwater marsh habitat the nearest occurrence is from 21 miles north east of the Project Area	**Not Observed.** This species was not observed during the July survey. No further actions are recommended for this species.
round-leaved filaree *California macrophylla*	Rank 1B	Cismontane woodland, valley and foothill grassland; located in areas underlain by clay substrate. Elevation range: 45 – 3900 feet. Blooms: March – May.	**Unlikely.** Although the Project Area contains some clay substrate, woodland and high quality grassland is not present. This species is known from mainland sites.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
Mt. Diablo fairy-lantern *Calochortus pulchellus*	Rank 1B	Chaparral, cismontane woodland, riparian woodland, valley and foothill grassland; located on wooded and brushy slopes. Elevation range: 95 – 2730 feet. Blooms: April – June.	**No Potential.** The Project Area does not contain chaparral, woodland, or natural / native upland grassland habitat necessary to support this species. There are no documented occurrences from the Delta islands.	No further actions are recommended for this species.
Bristly sedge *Carex comosa*	Rank 2	Coastal prairie, marshes and swamps, valley and foothill grassland. Elevation range: 0 – 2031 feet. Blooms: May – September.	**Moderate Potential.** Although the Project Area contains marsh habitat suitable for this species the nearest occurrence is from 10 miles east.	**Not Observed.** This species was not observed during the July survey. No further actions are recommended for this species.
Congdon's tarplant *Centromadia parryi* ssp. *congdonii*	Rank 1B	Valley and foothill grassland, coastal brackish marsh, vernal pools; often located on the margins of wetland and grassland habitat on alkaline, often white clay, soils. Elevation range: 0 – 750 feet. Blooms: May – October, sometimes November.	**Moderate Potential.** The Project Area contains grassy sites on wetland fringes that may support this species. Additionally, this species has a prodigious seed set and is relatively tolerant of disturbance. However, this species is known primarily south of the Delta/Suisun Bay. The nearest documented occurrence is from within eight miles of the Project Area.	**Not Observed.** This species was not observed during the July survey. No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
pappose tarplant *Centromadia parryi* ssp. *parryi*	Rank 1B	Coastal prairie, meadows and seeps, coastal salt marshes, valley and foothill grassland; located in vernally mesic, often alkaline sites. Elevation range: 5 – 1365 feet. Blooms: May – November.	**Moderate Potential.** The Project Area contains grassy sites and marsh fringe underlain by alkali substrates that may support this species. Additionally, this species has a prodigious seed set and is relatively tolerant of disturbance The nearest documented occurrence is from within eight miles of the Project Area.	**Not Observed.** This species was not observed during the July survey. No further actions are recommended for this species.
hispid bird's-beak *Chloropyron molle* ssp. *hispidum*	Rank 1B	Meadows, playas, valley and foothill grassland, damp alkaline soils; Elevation range: 3 – 509 feet. Blooms: June – September.	**Unlikely**. Although the Project Area contains grassland habitat, this species was unlikely to occur historically on Sherman Island. Additionally, a viable seed source is unlikely to colonize in the current conditions.	No further actions are recommended for this species.
soft bird's-beak *Chloropyron molle* ssp. *molle*	FE; SR; Rank 1B	Coastal salt marsh; located on edge of salt pannes and in low-growing salt grass, pickleweed, and fleshy jaumea. Elevation range: 0 – 10 feet. Blooms: July – November.	**Unlikely.** Although the Project Area contains marsh habitat with some associated species; high quality pickleweed marsh with pannes and active tides are not present.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
Bolander's hemlock *Cicuta maculata* var. *bolanderi*	Rank 2	Freshwater and brackish marshes and swamps. Elevation range: 0 – 650 feet. Blooms: July – September.	**High Potential.** The Project Area contains perennial wetland habitat that may support this species. The nearest documented occurrence is from within five miles of the Project Area.	**Not Observed.** This species was not observed during the July survey. No further actions are recommended for this species.
Suisun thistle *Cirsium hydrophilum* var. *hydrophilum*	FE; Rank 1B	Near small watercourses within salt marsh. Elevation range: 0 – 3 feet. Blooms: June – September.	**Moderate Potential.** The Project Area contains slough margins with associated species that may support this species. However, documented occurrences of this species are highly restricted to Suisun Marsh. The nearest documented occurrence is from within 15 miles of the Project Area.	No further actions are recommended for this species.
Mt. Diablo bird's beak *Cordylanthus nidularis*	SR; Rank 1B	Grassy or rocky areas in serpentine chaparral. Elevation range: 1980 – 2640 feet. Blooms: July – August.	**No Potential.** The Project Area contains no serpentine chaparral habitat.	No further actions are recommended for this species.
Hoover's cryptantha *Cryptantha hooveri*	Rank 1A	Valley and foothill grassland; located on coarse sandy substrates. Elevation range: 30 – 490 feet. Blooms: April – May.	**No Potential.** The Project Area does not contain sandy grassland habitat necessary to support this species.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
Hospital Canyon larkspur *Delphinium californicum* ssp. *interius*	Rank 1B	Cismontane woodland and wet, boggy openings in chaparral and in canyons. Elevation range: 990 – 3300 feet. Blooms: April – June	**No Potential.** The Project Area contains no suitable woodland habitat and no chaparral, and it is well below the known elevation range of the species.	No further actions are recommended for this species.
Norris' beard moss *Didymodon norisii*	Rank 2B	Cismontane woodland and lower montane coniferous forest. Elevation range. 1969 – 5578 feet.	**No Potential.** The Project Area contains no suitable woodland nor montane coniferous forest habitat and is well below the known elevation range of the species.	No further actions are recommended for this species.
dwarf downingia *Downingia pusilla*	Rank 2	Valley and foothill grassland, vernal pools; located in mesic grassy sites, pool and lake margins. Elevation range: 3 – 1450 feet. Blooms: March – May.	**Unlikely.** Although the Project Area contains seasonal wetland habitat, this species was unlikely to occur historically on Sherman Island. Additionally, a viable seed source is unlikely to colonize in the current conditions.	No further actions are recommended for this species.
Brandegee's eriastrum *Eriastrum brandegeeae*	Rank 1B	Chaparral and cismontane woodlands on barren, volcanic soils, often in open areas. Elevation range: 1001 – 3379 feet. Blooms: April – August.	**No potential.** The Project Area does not contain chaparral nor cismontane woodland on suitable substrate. Additionally, the Project Area is out of the known elevation range of this species.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
Antioch Dunes buckwheat *Eriogonum nudum* var. *psychicola*	Rank 1B	Interior dunes; known only from the Antioch Dunes, an interior Aeolian and alluvial dune system. Elevation range: 0 – 65 feet. Blooms: July – October.	**No Potential.** The Project Area does not contain interior dune habitat necessary to support this species.	No further actions are recommended for this species.
Delta button-celery *Eryngium racemosum*	Rank 1B	Riparian scrub, vernally mesic clay depressions. Elevation range: 10 – 98 feet. Blooms: June – October.	**No Potential.** The Project Area contains no riparian scrub.	No further actions are recommended for this species.
Mt. Diablo buckwheat *Eriogonum truncatum*	Rank 1B	Chaparral, coastal scrub, valley and foothill grassland; located on dry, exposed clay or sandy substrates. Elevation range: 10 – 1140 feet. Blooms: April – December.	**No Potential.** The Project Area does not contain chaparral, scrub, or foothill grassland habitat necessary to support this species.	No further actions are recommended for this species.
Contra Costa wallflower *Erysimum capitatum* var. *angustatum*	FE; SE; Rank 1B	Interior dunes; known only the Antioch Dunes, a stabilized interior dune system. Elevation range: 10 – 65 feet. Blooms: March – July.	**No Potential.** The Project Area does not contain interior dune habitat necessary to support this species.	No further actions are recommended for this species.
diamond-petal poppy *Eschscholzia rhombipetala*	Rank 1B	Valley and foothill grassland; located on slopes and flats underlain by alkali clay substrate. Elevation range: 0 – 3170 feet. Blooms: March – April.	**No Potential.** The Project Area does not contain high quality alkali grassland habitat necessary to support this mainland species.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
stinkbells *Fritillaria agrestis*	Rank 4	Cismontane woodland, chaparral, valley and foothill grassland; located in non-native grasslands underlain by clay, often serpentine, substrates. Elevation range: 30 – 5055 feet. Blooms: March – June.	**No Potential.** The Project Area does not contain woodland, chaparral, serpentine, or high quality clay grassland habitat necessary to support this mainland species.	No further actions are recommended for this species.
fragrant fritillary *Fritillaria liliacea*	Rank 1B	Coastal scrub, valley and foothill grassland, coastal prairie, cismontane woodland; located in grassy sites underlain by clay, typically derived from volcanics or serpentine. Elevation range: 10 – 1335 feet. Blooms: February – April.	**No Potential.** The Project Area does not contain high quality, native / natural grassland underlain by clay substrate necessary to support this species. Additionally, this species is typically associated with foothill sites or mima mound areas away from the Delta islands.	No further actions are recommended for this species.
Diablo helianthella *Helianthella castanea*	Rank 1B	Broadleaf upland forest, chaparral, cismontane woodland, coastal scrub, riparian woodland, valley and foothill grassland; typically located in oak woodland/chaparral ecotone underlain by rocky, azonal substrates, often in partial shade. Elevation range: 195 – 4225 feet. Blooms: March – June.	**No Potential.** The Project Area does not contain chaparral, woodland, forest, or scrub habitat necessary to support this species.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
Brewer's western flax *Hesperolinon breweri*	Rank 1B	Chaparral, cismontane woodland, valley and foothill grassland; typically located in serpentine grassland and serpentine chaparral underlain by rocky substrates. Elevation range: 95 – 2925 feet. Blooms: May – July.	**No Potential.** The Project Area does not contain chaparral, woodland, or serpentine grassland habitat necessary to support this species.	No further actions are recommended for this species.
woolly rose-mallow *Hibiscus lasiocarpus* var. *occidentalis*	Rank 1B	Freshwater marshes and swamps; located on moist riverbanks, slough edges, and low peat islands of the Delta region. Elevation range: 0 – 390 feet. Blooms: June – September.	**Moderate Potential.** The Project Area contains freshwater margins and sloughs that may support this species. However, this species has not been documented as far west in the Delta as the Project Area. The nearest documented occurrence is from within six miles of the Project Area.	**Not Observed.** This species was not observed during the July survey. No further actions are recommended for this species.
Carquinez goldenbush *Isocoma arguta*	Rank 1B	Valley and foothill grassland; located in flats and lower hills on low benches and near drainages in swale systems underlain by alkaline substrates. Elevation range: 5 – 65 feet. Blooms: August – December.	**Unlikely.** Although the Project Area contains swale-like drainages, this species is known from alkali grassland habitats not present in the Project Area.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
Northern California black walnut *Juglans hindsii*	Rank 1B	Riparian forest, riparian woodland; this species has been widely naturalized in California as rootstock of agricultural production; considered rare only in native, extant stands. Elevation range: 0 – 1430 feet. Blooms: April – May.	**Moderate Potential.** This species known from the Delta region; however, native extant stands are infrequent. The nearest documented occurrence is from within 14 miles of the Project Area.	**Not Present.** This species was not observed during late-season survey; therefore, no further actions are recommended for this species.
Contra Costa goldfields *Lasthenia conjugens*	FE; Rank 1B	Valley and foothill grassland, vernal pools, cismontane woodland; located in pools, swales, and depressions in mesic grassy sites underlain by alkaline substrate. Elevation range: 0 – 1530 feet. Blooms: March – June.	**Unlikely.** Although the Project Area contains seasonal wetland habitat, this species was unlikely to occur historically on Sherman Island. Additionally, a viable seed source is unlikely to colonize in the current conditions.	No further actions are recommended for this species.
Delta tule pea *Lathyrus jepsonii* var. *jepsonii*	Rank 1B	Freshwater and brackish marshes; typically located near or on slough margins, closely associated with cattail, tules, bulrushes, Baltic rush, California rose, and Suisun Marsh aster; known widely throughout Suisun Bay and Delta regions. Elevation range: 0 – 15 feet. Blooms: May – July, sometimes September.	**High Potential.** The Project Area contains slough margins and associated species that may support this species. The nearest documented occurrence is from the outboard levee of southern Sherman Island, immediately adjacent to the Project Area.	**Not Present.** This species was not observed during late-season survey; therefore, no further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
legenere *Legenere limosa*	Rank 1B	Vernals pools in valley grassland. Elevation range: 0 – 1000 feet. Blooms: April – June.	**Unlikely.** Although the Project Area contains seasonal wetland habitat, this species was unlikely to occur historically on Sherman Island. Additionally, a viable seed source is unlikely to colonize in the current conditions.	No further actions are recommended for this species.
woolly-headed lessingia *Lessingia hololeuca*	Rank 3	Serpentinite clay, broadleafed upland forest, coastal scrub, lower montane coniferous forest, and valley and foothill grassland. Elevation range: 33 – 1980 feet. Blooms: June – October.	**No potential.** The Project Area does not contain forest, shrubland, or upland grassland habitat for this species, nor does it have suitable substrate.	No further actions are recommended for this species.
Mason's lilaeopsis *Lilaeopsis masonii*	SR; Rank 1B	Freshwater and brackish marshes, riparian scrub; located on mud banks in splash zone on mud, muck, or silt substrates. Elevation range: 0 – 35 feet. Blooms: April – November.	**Unlikely.** Although the Project Area contains freshwater marsh habitat, this species was unlikely to occur historically on Sherman Island. Additionally, a viable seed source is unlikely to colonize in the current conditions.	No further actions are recommended for this species.
Delta mudwort *Limosella subulata*	Rank 2	Riparian scrub, freshwater marsh, brackish marsh; rarest of Delta plant species; typically located mud banks in marshy or scrubby areas; often associated with Mason's lilaeopsis. Elevation range: 0 – 10 feet. Blooms: May – August.	**Unlikely.** Although the Project Area contains freshwater marsh habitat, this species was unlikely to occur historically on Sherman Island. Additionally, a viable seed source is unlikely to colonize in the current conditions.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
showy golden madia *Madia radiata*	Rank 1B	Valley and foothill grassland, cismontane woodland, chenopod scrub; located on adobe clay in grassy areas or among open shrubs. Elevation range: 80 – 3950 feet. Blooms: March – May.	**No Potential.** The Project Area does not contain high quality grassland, woodland, or chenopod scrub habitat necessary to support this species.	No further actions are recommended for this species.
Hall's bush mallow *Malacothamnus hallii*	Rank 1B	Chaparral; often located on serpentine substrates. Elevation range: 30 – 2470 feet. Blooms: May – October.	**No Potential.** The Project Area does not contain chaparral habitat or serpentine soils necessary to support this species.	No further actions are recommended for this species.
woodland woollythreads *Monolopia gracilens*	Rank 1B	Chaparral, valley and foothill grassland, cismontane woodland, broadleaf upland forest, North Coast coniferous forest; located in open, grassy sites on sandy to rocky substrates often derived from serpentine, though the serpentine affinity may be weak. Elevation range: 325 – 3900 feet. Blooms: February – July.	**No Potential.** The Project Area does not contain chaparral, forest, upland grassland, nor serpentine substrate.	No further actions are recommended for this species.
Navarretia gowenii Lime Ridge navarretia	Rank 1B	Chaparral; located on calcium carbonate-rich clay substrates. Elevation range: 585 – 995 feet. Blooms: May – June.	**No Potential.** The Project Area does not contain chaparral nor carbonate-rich clay substrate.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
Navarretia nigelliformis ssp. *radians* shining navarretia	Rank 1B	Cismontane woodland, valley and foothill grassland, vernal pools; may be in grasslands and not vernal pools. Elevation range: 245 – 3250 feet. Blooms: April – July.	**No Potential.** The Project Area does not contain woodland nor upland grassland habitat. Although the Project Area contains seasonal wetland habitat, this species was unlikely to occur historically on Sherman Island. Additionally, a viable seed source is unlikely to colonize in the current conditions.	No further actions are recommended for this species.
Colusa grass *Neostapfia colusana*	FT; SE; Rank 1B	Vernal pools; typically located in deeper portions of pool bottoms underlain by adobe clay substrate. Elevation range: 15 – 650 feet. Blooms: May – August.	**Unlikely.** Although the Project Area contains seasonal wetlands, this species is known from high quality, deep vernal pool habitat not present in the Project Area.	No further actions are recommended for this species.
Antioch Dunes evening-primrose *Oenothera deltoides* ssp. *howellii*	FE; SE; Rank 1B	Interior dunes; located on stabilized interior dunes and ancient river bluffs in the Antioch Dune system. Elevation range: 0 – 100 feet. Blooms: March – September.	**No Potential.** The Project Area does not contain interior dune habitat necessary to support this species.	No further actions are recommended for this species.
Phacelia phacelioides Mt. Diablo phacelia	Rank 1B	Chaparral, cismontane woodland; located on rock outcrops and talus slopes, sometimes derived from serpentine. Elevation range: 1625 – 4455 feet. Blooms: April – May.	**No Potential.** The Project Area does not contain chaparral, woodland, nor serpentine substrate.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
bearded-nut popcornflower *Plagiobothrys hystriculus*	Rank 1B	Vernal pools, valley and foothill grassland; located in wet grassy sites. Elevation range: 0 – 890 feet. Blooms: April – May.	**Unlikely.** Although the Project Area contains seasonal wetland habitat, this species was unlikely to occur historically on Sherman Island. Additionally, a viable seed source is unlikely to colonize in the current conditions.	No further actions are recommended for this species.
eel-grass ponweed *Potamogeton zosteriformis*	Rank 2	Marshes and swamps; truly aquatic species located in ponds, lakes, and slack water of streams and rivers. Elevation range: 145 – 195 feet. Blooms: July – August.	**Moderate Potential.** The Project Area contains standing water that may support this species. The nearest documented occurrence is from 10 miles within the Project Area.	**Not Observed.** This species was not observed during the July survey. No further actions are recommended for this species.
Sanford's arrowhead *Sagittaria sanfordii*	Rank 1B	Marshes and swamps; truly aquatic species located in ponds, lakes, and slack water of streams and rivers. Elevation range: 0 – 2115 feet. Blooms: May – October.	**Moderate Potential.** The Project Area contains standing water that may support this species. However, this species has not been documented as far west in the Delta as the Project Area. The nearest documented occurrence is from ten miles within the Project Area.	**Not Observed.** This species was not observed during the July survey. No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
Sanicula saxatilis rock sanicle	SR; Rank 1B	Broadleaf upland forest, chaparral, valley and foothill grassland; located on direct bedrock or talus in chaparral or oak woodland habitat. Elevation range: 2015 – 3820 feet. Blooms: April – May.	**No Potential.** The Project Area does not contain upland forest, chaparral, nor upland grassland.	No further actions are recommended for this species.
Marsh skullcap *Scutellaria galericulata*	Rank 2	Lower montane coniferous forests, meadows and seeps (mesic), marshes and swamps. Elevation range: 0 – 6825 feet. Blooms: June – September.	**Moderate Potential.** The Project Area contains marsh habitat that may support this species. However, this species has not been documented as far west in the Delta as the Project Area. The nearest documented occurrence is from 10 miles within the Project Area.	**Not Observed.** This species was not observed during the July survey. No further actions are recommended for this species.
side-flowering skullcap *Scutellaria lateriflora*	Rank 2	Meadows and seeps, marshes and swamps; located in wet meadows and marsh habitat, and often on logs in the Delta region. Elevation range: 0 – 1625 feet. Blooms: July – September.	**Moderate Potential.** The Project Area contains marsh habitat that may support this species. However, this species has not been documented as far west in the Delta as the Project Area. The nearest documented occurrence is from 12 miles within the Project Area.	**Not Observed.** This species was not observed during the July survey. No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
chaparral ragwort *Senecio aphanactis*	Rank 2	Cismontane woodland, coastal scrub; located on drying alkali flats. Elevation range: 45 – 2600 feet. Blooms: January – April.	**No Potential.** The Project Area does not contain woodland or scrub habitat necessary to support this species.	No further actions are recommended for this species.
Keck's checkerbloom *Sidalcea keckii*	FE; Rank 1B	Cismontane woodland, valley and foothill grassland; located on grassy slopes in blue oak woodland. Elevation range: 240 – 2115 feet. Blooms: April – June.	**No Potential.** The Project Area does not contain blue oak woodland habitat necessary to support this species.	No further actions are recommended for this species.
Streptanthus albidus ssp. *peramoenus* most beautiful jewel-flower	Rank 1B	Chaparral, cismontane woodland, valley and foothill grassland; located on serpentine outcrops on ridges and slopes. Elevation range: 305 – 3250 feet. Blooms: March – October.	**No Potential.** The Project Area does not contain chaparral, woodland, upland grassland, nor serpentine substrate.	No further actions are recommended for this species.
Streptanthus hispidus Mt. Diablo jewel-flower	Rank 1B	Valley and foothill grassland, chaparral; located on rock outcrops and talus slopes. Elevation range: 1185 – 3900 feet. Blooms: March – June.	**No Potential.** The Project Area does not contain upland grassland, chaparral, rock outcrops, or talus slopes.	No further actions are recommended for this species.
Stuckenia filiformis slender-leaved pondweed	Rank 2	Marshes and swamps; located in shallow, clear water of lakes, low-gradient streams, channels, and ditches. Elevation range: 975 – 6990 feet. Blooms: May – July.	**Moderate Potential.** The Project Area contains shallow, freshwater habitat, though it is below the known elevation range.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
Suisun Marsh aster *Symphyotrichum lentum*	Rank 1B	Freshwater and brackish marshes and swamps; typically located on slough margins and edges, closely associated with cattail, tules, bulrushes, California rose, and Delta Tule pea. Elevation range: 0 – 10 feet. Blooms: May – November.	**High Potential.** The Project Area contains slough margins with associated species that may support this species. The nearest documented occurrence is from the outboard levee of southern Sherman Island, immediately adjacent to the Project Area.	**Not Present.** This species was not observed during late-season survey; therefore, no further actions are recommended for this species.
Trifolium hydrophilum saline clover	Rank 1B	Marshes and swamps, mesic portions of alkali vernal pools, mesic, alkali valley and foothill grassland. Elevation range: 0 – 985 feet. Blooms: April – June.	**Unlikely.** Although the Project Area contains alkali, seasonal wetland habitat, this species was unlikely to occur historically on Sherman Island. Additionally, a viable seed source is unlikely to colonize in the current conditions.	No further actions are recommended for this species.
Triquetrella californica coastal triquetrella	Rank 1B	Coastal bluff scrub, coastal scrub, valley and foothill grassland; grows within 100 feet of the coastline in scrub and grasslands on open gravel substrates of roads, hillsides, bluffs, and slopes. Elevation range: 30 – 325 feet.	**No Potential.** The Project Area does not contain shrubland nor upland grasslands. Additionally, the Project Area is far out of the coastal range of this species.	No further actions are recommended for this species.
caper-fruited tropidocarpum *Tropidocarpum capparideum*	Rank 1B	Valley and foothill grassland; located on alkaline clay substrates. Elevation range: 3 – 1480 feet. Blooms: March – April.	**No Potential.** The Project Area does not contain high quality alkali grassland habitat necessary to support this species.	No further actions are recommended for this species.

SPECIES	STATUS*	HABITAT REQUIREMENTS	POTENTIAL TO OCCUR IN PROJECT AREA	RECOMMENDATIONS
oval-leaf viburnum *Viburnum ellipticum*	Rank 2	Chaparral, cismontane woodland, lower montane coniferous forest. Elevation range: 700 – 4550 feet. Blooms: May – June.	**No Potential.** The Project Area does not contain chaparral, woodland, or forest habitat necessary to support this species.	No further actions are recommended for this species.

*** Key to status codes:**

FE	Federal Endangered
FT	Federal Threatened
SE	State Endangered
ST	State Threatened
SR	State Rare
Rank 1A	CNPS Rank 1A: Plants presumed extinct in California
Rank 1B	CNPS Rank 1B: Plants rare, threatened or endangered in California and elsewhere
Rank 2	CNPS Rank 2: Plants rare, threatened, or endangered in California, but more common elsewhere

Species Evaluations:

No Potential. Habitat on and adjacent to the site is clearly unsuitable for the species requirements (cover, substrate, elevation, hydrology, plant community, site history, disturbance regime).

Unlikely. Few of the habitat components meeting the species requirements are present, and/or the majority of habitat on and adjacent to the site is unsuitable or of very poor quality. The species is not likely to be found on the site.

Moderate Potential. Some of the habitat components meeting the species requirements are present, and/or only some of the habitat on or adjacent to the site is unsuitable. The species has a moderate probability of being found on the site.

High Potential. All of the habitat components meeting the species requirements are present and/or most of the habitat on or adjacent to the site is highly suitable. The species has a high probability of being found on the site.

Present. Species was observed on the site or has been recorded (i.e. CNDDB, other reports) on the site recently.

APPENDIX B

Plant Species Observed in the Project Area April 30 and May 1, 2013 and July 15 and 16, 2013

Table B. Plant species observed in the Project Area, April 30, May 1, July 15, and July 16, 2013

Family	Scientific name	Common name	Life form	Origin	Rare Status[1]	Invasive Status[2]	Wetland indicator[3]
Aizoaceae	*Sesuvium verrucosum*	verrucose seapurslane	perennial forb	native	--	--	FACW
Apiaceae	*Apium graveolens*	garden celery	annual forb	non-native	--	--	NL
Apiaceae	*Conium maculatum*	poison hemlock	perennial forb	non-native	--	moderate	FACW
Apiaceae	*Foeniculum vulgare*	fennel	perennial forb	non-native	--	high	NL
Apiaceae	*Oenanthe sarmentosa*	water parsely	perennial forb	native	--	--	OBL
Araceae	*Lemna minor*	common duckweed	perennial forb	native	--	--	OBL
Asperagaceae	*Asperagus officinalis*	garden asperagus	perennial forb	non-native	--	--	FACU
Asteraceae	*Artemisia douglasiana*	mugwort	perennial forb	native	--	--	FAC
Asteraceae	*Baccharis glutinosa*	marsh baccharis	perennial forb	native	--	--	FACW
Asteraceae	*Baccharis pilularis*	coyote bush	perennial forb	native	--	--	NL
Asteraceae	*Carduus pycnocephalus*	Italian thistle	annual forb	non-native	--	moderate	NL
Asteraceae	*Centaurea calcitrapa*	purple star thistle	annual forb	non-native	--	moderate	NL
Asteraceae	*Centaurea solstitialis*	yellow star thistle	annual forb	non-native	--	high	NL
Asteraceae	*Cirsium vulgare*	bull thistle	perennial forb	non-native	--	moderate	FACU
Asteraceae	*Cotula coronopifolia*	common brassbuttons	perennial forb	non-native	--	limited	OBL
Asteraceae	*Cynara cardunculus ssp. cardunculus*	artichoke	perennial forb	non-native	--	moderate	NL
Asteraceae	*Dittrichia graveolens*	stinkwort	annual forb	non-native	--	moderate	NL
Asteraceae	*Erigeron canadensis*	Canadian horseweed	annual forb	native	--	--	FACU
Asteraceae	*Euthamia occidentalis*	western goldentop	perennial forb	native	--	--	FACW
Asteraceae	*Helianthus annuus*	common sunflower	annual forb	native		--	FACU
Asteraceae	*Helminthotheca echioides*	bristly ox-tongue	perennial forb	non-native	--	limited	FACU
Asteraceae	*Hypochaeris radicata*	hairy catsear	perennial forb	non-native	--	moderate	FACU
Asteraceae	*Lactuca serriola*	prickly lettuce	annual forb	non-native	--	assessed	FACU
Asteraceae	*Pluchea odorata*	salt marsh	perennial forb	native	--	--	FACW

Family	Scientific name	Common name	Life form	Origin	Rare Status[1]	Invasive Status[2]	Wetland indicator[3]
		fleabane					
Asteraceae	*Pseudognaphalium luteoalbum*	Jersey cudweed	annual forb	non-native	--	--	FAC
Asteraceae	*Senecio vulgaris*	old man in the Spring	annual forb	non-native	--	--	FACU
Asteraceae	*Silybum marianum*	milk thistle	perennial forb	non-native	--	limited	NL
Asteraceae	*Sonchus asper ssp. asper*	prickly sow thistle	annual forb	non-native	--	assessed	FAC
Asteraceae	*Xanthium spinosum*	spiny cocklebur	annual forb	native	--	--	FACU
Asteraceae	*Xanthium strumarium*	rough cocklebur	annual forb	native	--	--	FAC
Boraginaceae	*Heliotropium curassavicum var. oculatum*	seaside heliotrope	perennial forb	native	--	--	FACU
Brassicaceae	*Brassica nigra*	black mustard	annual forb	non-native	--	moderate	NL
Brassicaceae	*Lepidium didymum*	coronopus pepperweed	annual forb	non-native	--	--	NL
Brassicaceae	*Lepidium draba*	white top	perennial forb	non-native	--	moderate	NL
Brassicaceae	*Lepidium latifolium*	perennial pepperweed	perennial forb	non-native	--	high	FAC
Brassicaceae	*Raphanus sativus*	wild radish	perennial forb	non-native	--	limited	NL
Caryophyllaceae	*Spergularia bocconi*	Boccon's sanspurry	annual forb	non-native	--	--	FACW
Caryophyllaceae	*Spergularia macrotheca var. macrotheca*	sticky sandspurry	perennial forb	native	--	--	FAC
Caryophyllaceae	*Spergularia rubra*	red sandspurry	perennial forb	non-native	--	--	FAC
Chenopodiaceae	*Atriplex prostrata*	fat hen	annual forb	non-native	--	--	FACW
Chenopodiaceae	*Atriplex semibaccata*	Australian saltbush	perennial forb	non-native	--	moderate	FAC
Chenopodiaceae	*Chenopodium album*	white goosefoot	annual forb	non-native	--	--	FACU
Chenopodiaceae	*Salicornia pacifica*	Pacific swampfire	perennial forb	native	--	--	OBL
Convolvulaceae	*Convolvulus arvensis*	field bindweed	perennial forb	non-native	--	assessed	NL
Convolvulaceae	*Cressa truxillensis*	spreading alkaliweed	perennial forb	native	--	--	FACW
Convolvulaceae	*Cuscuta campestris*	field dodder	annual vine	native	--	--	NL

Family	Scientific name	Common name	Life form	Origin	Rare Status[1]	Invasive Status[2]	Wetland indicator[3]
Cyperaceae	*Bolboschoenus robustus*	robust bulrush	perennial graminoid	native	--	--	OBL
Cyperaceae	*Cyperus eragrostis*	tall flatsedge	perennial graminoid	native	--	--	FACW
Cyperaceae	*Eleocharis macrostachya*	common spikerush	perennial graminoid	native	--	--	OBL
Cyperaceae	*Isolepis cernua*	low bulrush	annual graminoid	native	--	--	OBL
Cyperaceae	*Schoenoplectus acutus var. occidentalis*	tule	perennial graminoid	native	--	--	OBL
Cyperaceae	*Schoenoplectus americanus*	chairmaker's bulrush	perennial graminoid	native	--	--	OBL
Cyperaceae	*Schoenoplectus californicus*	California bulrush	perennial graminoid	native	--	--	OBL
Fabaceae	*Acmispon americanus var. americanus*	American lotus	annual forb	native	--	--	NL
Fabaceae	*Lotus corniculatus*	bird's-foot trefoil	perennial forb	non-native	--	assessed	FAC
Fabaceae	*Lupinus bicolor*	miniature lupine	annual forb	native	--	--	NL
Fabaceae	*Medicago polymorpha*	bur medic	annual forb	non-native	--	limited	FACU
Fabaceae	*Melilotus albus*	white sweetclover	annual forb	non-native		assessed	NL
Fabaceae	*Melilotus indicus*	yellow annual sweetclover	annual forb	non-native	--	--	FACU
Fabaceae	*Trifolium dubium*	Shamrock clover	annual forb	non-native	--	--	UPL
Fabaceae	*Trifolium fragiferum*	strawberry clover	perennial forb	non-native	--	--	FACU
Fabaceae	*Trifolium subterraneum*	subterranean clover	annual forb	non-native	--	--	NL
Fabaceae	*Vicia villosa ssp. varia*	woollypod vetch	annual forb	non-native	--	--	NL
Frankeniaceae	*Frankenia salina*	alkali heath	perennial forb	native	--	--	FACW
Geraniaceae	*Erodium botrys*	longbeak stork's bill	annual forb	non-native	--	assessed	FACU
Geraniaceae	*Erodium brachycarpum*	foothill filaree	annual forb	non-native	--	limited	NL
Geraniaceae	*Erodium cicutarium*	redstem stork's bill	annual forb	non-native	--	limited	NL
Iridaceae	*Iris pseudacorus*	paleyellow iris	perennial forb	non-native	--	limited	OBL
Juncaceae	*Juncus balticus ssp. ater*	Baltic rush	perennial graminoid	native	--	--	FACW
Juncaceae	*Juncus bufonius var. bufonius*	toad rush	annual graminoid	native	--	--	FACW

Family	Scientific name	Common name	Life form	Origin	Rare Status[1]	Invasive Status[2]	Wetland indicator[3]
Lythraceae	*Lythrum hyssopifolia*	hyssop loosestrife	annual forb	non-native	--	moderate	OBL
Malvaceae	*Fremontodendron californicum*	California flannelbush	evergreen shrub	native	--	--	NL
Malvaceae	*Malva nicaeensis*	bull mallow	annual forb	non-native	--	--	NL
Malvaceae	*Malvella leprosa*	alkali mallow	perennial forb	native	--	--	FACU
Moraceae	*Ficus carica*	common fig	deciduous tree	non-native	--	moderate	FACU
Myrsinaceae	*Anagallis arvensis*	scarlet pimpernel	annual forb	non-native	--	--	NL
Onagraceae	*Epilobium brachycarpum*	annual willowherb	annual forb	native	--	--	NL
Onagraceae	*Ludwigia peploides ssp. montevidensis*	floating primrose willow	perennial forb	non-native	--	high	OBL
Plantaginaceae	*Plantago lanceolata*	English plantain	perennial forb	non-native	--	limited	FAC
Plantaginaceae	*Plantago major*	common plantain	perennial forb	non-native	--	--	FAC
Poaceae	*Arundo donax*	giant reed	perennial graminoid	non-native	--	high	FACW
Poaceae	*Avena barbata*	slender oat	annual graminoid	non-native	--	moderate	NL
Poaceae	*Bromus catharticus var. elatus*	Chilean brome	perennial graminoid	non-native	--	--	NL
Poaceae	*Bromus diandrus*	ripgut brome	annual graminoid	non-native	--	moderate	NL
Poaceae	*Bromus hordeaceus*	soft chess	annual graminoid	non-native	--	limited	FACU
Poaceae	*Cortaderia jubata*	Pampas grass	perennial graminoid	non-native	--	high	FACU
Poaceae	*Crypsis schoenoides*	swamp pricklegrass	annual graminoid	non-native	--	--	OBL
Poaceae	*Cynodon dactylon*	Bermuda grass	perennial graminoid	non-native	--	moderate	FACU
Poaceae	*Digitaria sanguinalis*	hairy crabgrass	annual graminoid	non-native	--	--	NL
Poaceae	*Distichlis spicata*	saltgrass	perennial graminoid	native	--	--	FAC
Poaceae	*Echinochloa crus-galli*	watergrass	annual graminoid	non-native	--	--	FACW
Poaceae	*Festuca perennis*	Italian rye grass	annual graminoid	non-native	--	moderate	FAC
Poaceae	*Hordeum jubatum ssp. jubatum*	foxtail barley	perennial graminoid	native	--	--	FAC
Poaceae	*Hordeum marinum ssp. gussoneanum*	Mediterranean barley	annual graminoid	non-native	--	moderate	FAC
Poaceae	*Hordeum murinum ssp. leporinum*	mouse barley	annual graminoid	non-native	--	moderate	FACU
Poaceae	*Phalaris aquatica*	harding grass	perennial graminoid	non-native	--	moderate	FACU

Family	Scientific name	Common name	Life form	Origin	Rare Status[1]	Invasive Status[2]	Wetland indicator[3]
Poaceae	*Phragmites australis*	common reed	perennial graminoid	non-native	--	limited	FACW
Poaceae	*Poa annua*	annual bluegrass	annual graminoid	non-native	--	--	FACU
Poaceae	*Polypogon interruptus*	ditch rabbit's-foot grass	perennial graminoid	non-native	--	--	FACW
Poaceae	*Polypogon monspeliensis*	rabbit's-foot grass	annual graminoid	non-native	--	limited	FACW
Polygonaceae	*Persicaria maculosa*	spotted lady's-thumb	annual forb	non-native	--	--	FACW
Polygonaceae	*Polygonum aviculare ssp. aviculare*	dooryard knotweed	perennial forb	non-native	--	--	FACW
Polygonaceae	*Rumex pulcher*	fiddle dock	perennial forb	non-native	--	--	FAC
Ranunculaceae	*Ranunculus muricatus*	spiny buttercup	perennial forb	non-native	--	--	FACW
Ranunculaceae	*Ranunculus sceleratus*	cursed buttercup	annual forb	native	--	--	OBL
Rosaceae	*Rosa californica*	California rose	evergreen shrub	native	--	--	FAC
Rosaceae	*Rubus armeniacus*	Himalayan blackberry	evergreen shrub	non-native	--	high	FACU
Salicaceae	*Salix exigua var. exigua*	sandbar willow	deciduous tree	native	--	--	FACW
Salicaceae	*Salix laevigata*	red willow	deciduous tree	native	--	--	FACW
Salicaceae	*Salix lasiolepis*	arroyo willow	deciduous tree	native	--	--	FACW
Solanaceae	*Solanum americanum*	American black nightshade	perennial forb	native	--	--	FACU
Typhaceae	*Typha angustifolia*	narrowleaf cattail	perennial forb	non-native	--	--	OBL
Typhaceae	*Typha latifolia*	common cattail	perennial forb	native	--	--	OBL
Urticaceae	*Urtica dioica ssp. gracilis*	American stinging nettle	perennial forb	native	--	--	FAC

All species identified using the *Jepson Manual II: Vascular Plants of California* (Baldwin et al. 2012); Nomenclature follows Baldwin et al. 2012

[1]Rare Status: The CNPS Inventory of Rare and Endangered Plants (CNPS 2013)

FE: Federal Endangered
FT: Federal Threatened
SE: State Endangered
ST: State Threatened
SR: State Rare
Rank 1A: Plants presumed extinct in California
Rank 1B: Plants rare, threatened, or endangered in California and elsewhere

Rank 2: Plants rare, threatened, or endangered in California, but more common elsewhere
Rank 3: Plants about which we need more information – a review list
Rank 4: Plants of limited distribution – a watch list

[2]Invasive Status: California Invasive Plant Inventory (Cal-IPC 2006)

High: Severe ecological impacts; high rates of dispersal and establishment; most are widely distributed ecologically.
Moderate: Substantial and apparent ecological impacts; moderate-high rates of dispersal, establishment dependent on disturbance; limited-moderate distribution ecologically
Limited: Minor or not well documented ecological impacts; low-moderate rate of invasiveness; limited distribution ecologically
Assessed: Assessed by Cal-IPC and determined to not be an existing current threat

[3]Wetland Status: National List of Plant Species that Occur in Wetlands, California (Lichvar 2012)

OBL: Almost always found in wetlands; >99% frequency
FACW: Usually found in wetlands; 67-99% frequency
FAC: Equally found in wetlands and uplands; 34-66% frequency
FACU: Usually not found in wetlands; 1-33% frequency
UPL: Almost never found in wetlands; >1% frequency
NL: Not listed, assumed almost never found in wetlands; >1% frequency
NI: No information; not factored during wetland delineation

APPENDIX C

Representative Photographs of the Project Area

Top: Project Area including pasture field and Himalayan blackberry patch (view: south west).

Bottom: Project Area from bottom of outboard levee with pasture fields dominated by *Lepidium latifolium* (view: north).

Photographs taken July 15, 2013

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Top: Pasture fields and seasonal wetland ditch (view: south).

Bottom: Himalayan blackberry patch

Photographs taken July 15, 2013

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Top: Seasonal wetland ditch (view: south west).

Bottom: Perennial wetland ditch (view: south west).

Photographs taken July 15, 2013

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Top: Perennial freshwater wetland marsh (view: east).

Bottom: Perennial freshwater wetland marsh (view: west).

Photographs taken July 15, 2013

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APPENDIX C

Cultural Resources

A Cultural Resources Survey for the Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project Sacramento County, California

Eileen Barrow, M.A./RPA

July 3, 2013

A Cultural Resources Survey for the Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project Sacramento County, California

Prepared by:

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July 3, 2013

ABSTRACT

Tom Origer & Associates conducted a cultural resources survey of an approximately 900 acre portion of Sherman Island, Sacramento County, California, as requested by Aaron Will, Regional Biologist for Ducks Unlimited, Inc. This study addresses historic property concerns for the Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project, and was designed to meet the requirements of Section 106 of the National Historic Preservation Act and the California Environmental Quality Act.

The study included archival research at the North Central Information Center, Sacramento State University (File No. SAC-13 -69), examination of the library and files of Tom Origer & Associates, contact with the Native American community, and field inspection of the project's Area of Potential Effects. Field survey found no historic properties within the Area of Potential Effects. Documentation pertaining to this study is on file at the offices of Tom Origer & Associates (File No. 13-54).

Synopsis

Project: Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project
Location: Sherman Island, Sacramento County, California
Quadrangle: Antioch North, California 7.5' series
Study Type: Intensive survey
Scope: Approximately 900 acres of reclaimed land
Finds: None

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INTRODUCTION

This report describes a cultural resources survey for the Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project in Sacramento County, California (Figure 1). The Area of Potential Effects (APE) include s approximately 900 acres in the southwest portion of Sherman Island where wetland restoration activities are to take place. The study was requested by Aaron Will of Ducks Unlimited, Inc., and was designed to satisfy requirements of the National Historic Preservation Act and the California Environmental Quality Act. Documentation pertaining to this study is on file at the offices of Tom Origer & Associates (File No. 13-54).

REGULATORY CONTEXT

This project is subject to Section 106 of the National Historic Preservation Act (Section 106). Under Section 106, when a federal agency is involved in an undertaking, it must take into account the effects of the undertaking on historic properties (36CFR Part 800). Compliance with Section 106 requires that agencies make an effort to identify historic properties that might be affected by a project.

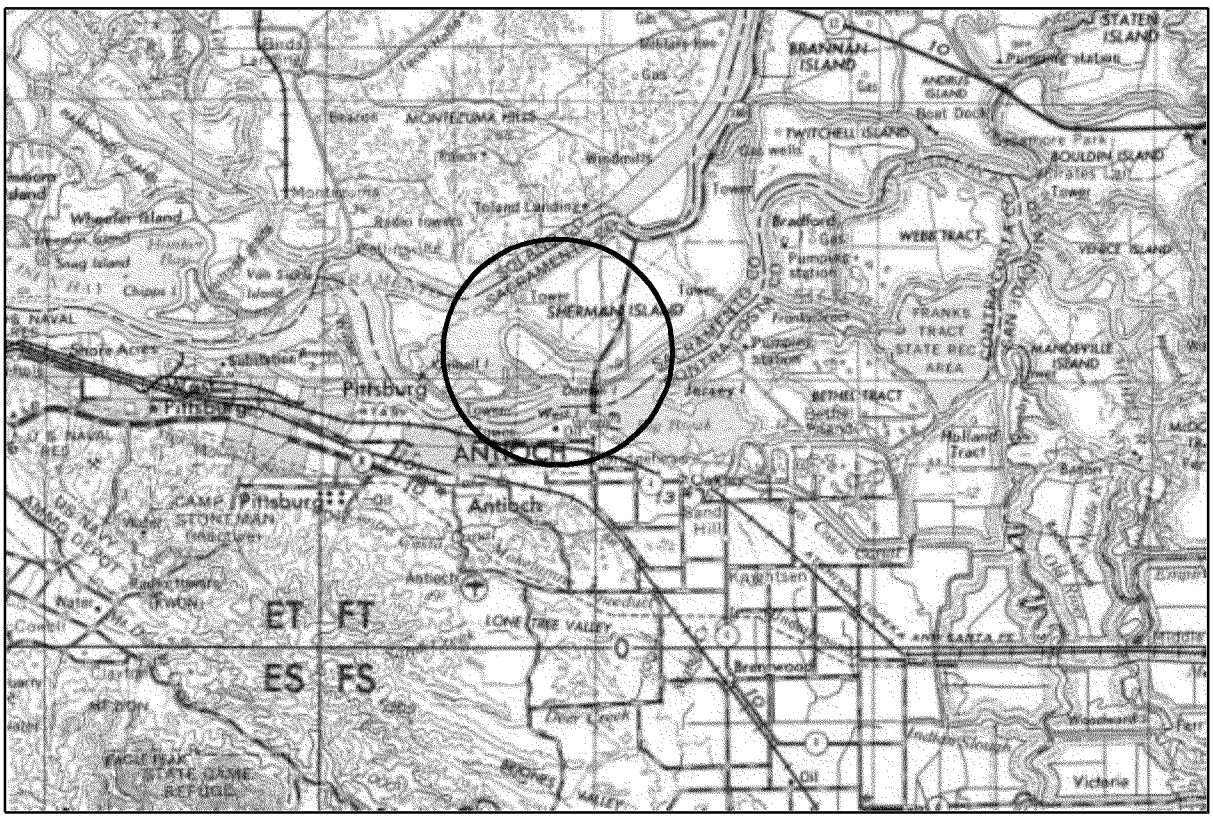

Figure 1. Project vicinity (adapted from the 1970 Sacramento 1:250,000-scale USGS map).

The California Environmental Quality Act (CEQA) requires that cultural resources be considered during the environmental review process. This is accomplished by creating an inventory of cultural properties within a project's area of potential effect (APE) and by assessing the potential that cultural resources could be affected by the project.

Pursuant to Section 106 and the CEQA Guidelines, the goals of this study were to: 1) identify all historic properties within the project's APE; 2) provide an evaluation of the significance of identified properties; 3) determine the properties' vulnerability to adverse affects that could arise from project activities; and 4) offer recommendations designed to protect historic property values, as warranted.

The National Register defines a historic property as a district, site, building, structure, or object significant in American history, architecture, engineering, archaeology, and culture, and that may be of value to the nation as a whole or important only to the community in which it is located. These resource types are described by the National Park Service (NPS) as follows (NPS 1995:4-5).

> **Site.** A site is the location of a significant event, a prehistoric or historic occupation or activity, or a building or structure, whether standing, ruined, or vanished, where the location itself possesses historic, cultural, or archaeological value regardless of the value of any existing structure.
>
> **Building.** A building, such as a house, barn, church, hotel, or similar construction, is created principally to shelter any form of human activity. "Building" may also be used to refer to a historically and functionally related unit, such as a courthouse and jail, or a house and barn.
>
> **Structure.** The term "structure" is used to distinguish from buildings those functional constructions made usually for purposes other than creating human shelter.
>
> **Object.** The term "object" is used to distinguish from buildings and structures those constructions that are primarily artistic in nature or are relatively small in scale and simply constructed. Although it may be, by nature or design, movable, an object is associated with a specific setting or environment.
>
> **District.** A district possesses a significant concentration, linkage, or continuity of sites, buildings, structures, or objects united historically or aesthetically by plan or physical development.

Significance Criteria

When a project might affect a cultural resource, the project proponent is required to conduct an assessment to determine whether the effect may be one that is significant. Consequently, it is necessary to determine the importance of resources that could be affected. For purposes of

the National Register, the importance of a historic resource is evaluated in terms of criteria put forth in 36CFR60 (see below). Eligibility criteria for the California Register of Historical Resources (Title 14 CCR, §4852) are very similar and will not be presented here.

> The quality of significance is present in properties that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:
>
> A. That are associated with events that have made a significant contribution to the broad patterns of our history; or
>
> B. That are associated with the lives of persons significant in our past; or
>
> C. That embody the distinct characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> D. That have yielded or may be likely to yield, information important in prehistory or history.

Additionally, the OHP advocates that all historical resources over 45 years old be recorded for inclusion in the OHP filing system (OHP 1995:2), although professional judgment is urged in determining whether a resource warrants documentation.

PROJECT DESCRIPTION AND SETTING

Project Location and Description

The APE is located in the Sacramento-San Joaquin river delta, in the extreme southwestern part of Sacramento County. The APE consists of reclaimed marshland used primarily as pasture on Sherman Island near the confluence of the Sacramento and San Joaquin rivers. The APE is bordered by Mayberry Slough on the north, and on the south by Mayberry Slough and the San Joaquin River. The east and west portions of the APE are bordered by pastureland. The APE is artificially drained by a series of ditches and protected from flooding by levees. (Figure 2). A lake of approximately 10 acres is present in the southeast portion of the APE.

Soils within the APE are a mix of Gazwell and Rindge soils (Tugel 1993: Sheet 21). Gazwell soils form in alluvium, and are generally found at or below sea level (Tugel 1993:61). Rindge soils are a mucky, silt loam that occur at elevations of from five to 20 feet below sea level, and were formed in very poorly drained tule and reed plant remains (Tugel 1993:91-93). When uncultivated, hydrophytic plants, annual grasses, and forbs are the chief vegetation on these two soils (Tugel 1993:61, 91-93). Gazwell soils have been used as range land while Rindge soils are used for growing irrigated crops (Tugel 1993:61, 91-93).

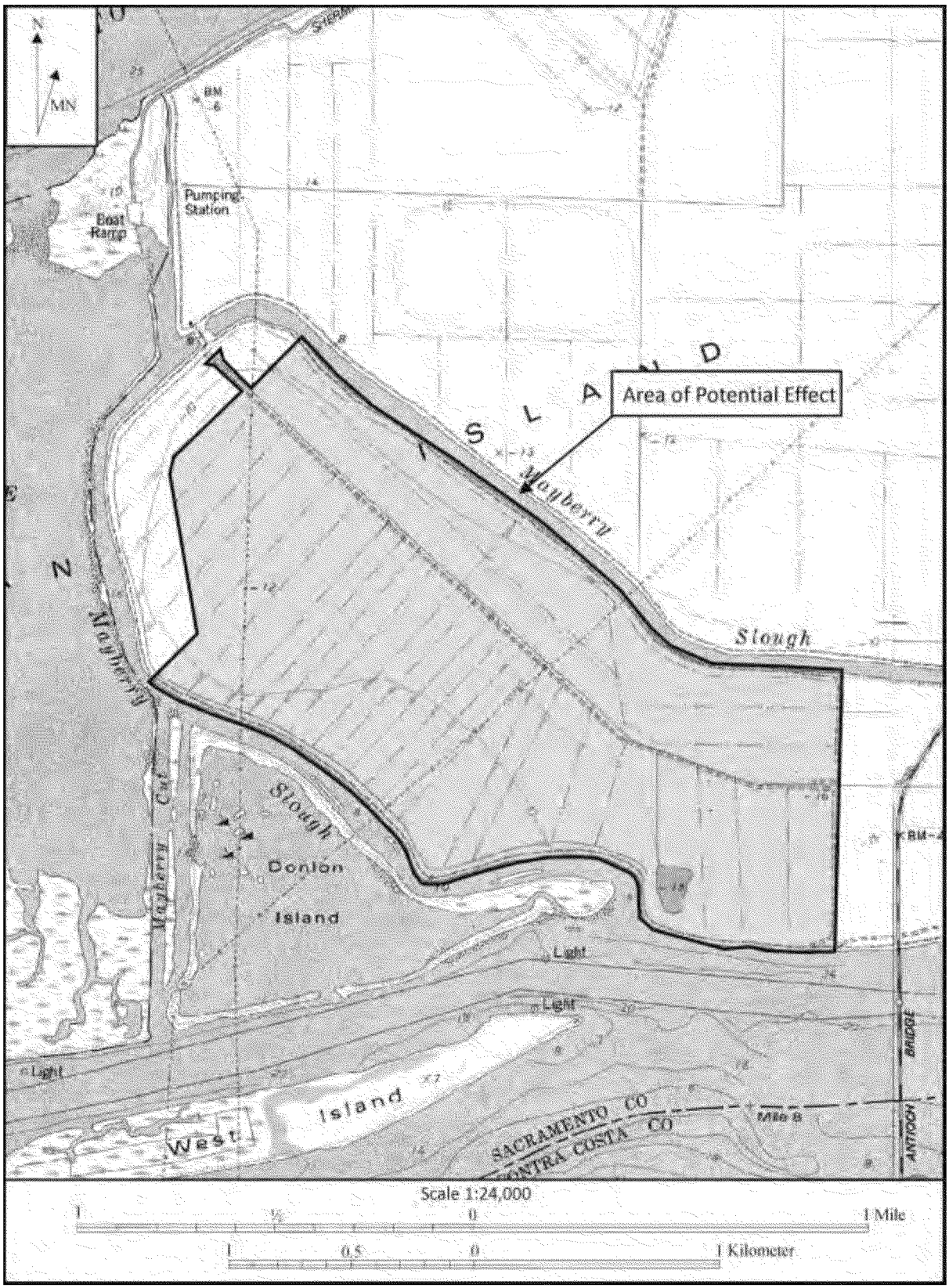

Figure 2. Area of Potential Affects - (adapted from the 1978 USGS Antioch North and 1978 USGS Jersey Island 7.5' maps).

At the end of the Last Glacial Maximum, approximately 18,000 years ago, sea levels were about 130 meters below current levels, San Francisco Bay was open grassland, and one could walk to the Farrallon Islands (Bickel 1978; Burroughs 2005:41; Parkman 2006:1). As temperatures began to rise, so too did sea levels. By 7,000 years ago waters began to push past San Francisco Bay into what is now the Sacramento-San Joaquin river delta (Drexel *et al.* 2009:372; Mount and Twiss 2005:3). Sea levels reached within five meters of their current levels approximately 4,000 years ago (Booth *et al* . 2004:30). Recent studies have corroborated the date of the development of the delta area by carbon-14 dating cores taken on Sherman Island, (both within and outside of the current APE) and other areas in the delta. Dates taken from the bottom of the cores were consistently approximately 6,500 years old (Drexel *et al*. 2009). Over the next 6,350 years the Sacramento-San Joaquin delta developed into a tule marsh lined with riparian forests along natural levees (West *et al* . 2007:24). Studies have shown that during this 6,350 year time, several meters of peat soils formed above the old ground surface. It is estimated that a total of five billion cubic meters of tidal marsh sediment have accumulated in the delta (Mount and Twiss 2005:12). Although several meters of soil have been lost to subsidence (Deverel and Leighton 2012; Drexel *et al*. 2009; Mount and Twiss 2005) there is an estimated 5 to 15 thick surface deposit of peat-rich soils remaining on Sherman Island (Deverel and Leighton 2010).

In the Sacramento-San Joaquin river delta, archaeological sites are typically found, "on the tops of partly drowned dunes (so-called sand mounds) and higher natural levees" (West *et al*. 2007:24). The marshland portions of the delta could have been a place people would visit to collect resources. It is possible that isolated tools could be found as a result of this activity, but there is a low likelihood of buried prehistoric sites being present within the peat soils which would have been marshland between 150 and 6,500 years ago.

There is a possibility that there are sites buried below the existing 5 to 15 meters of peat soils (see Deverel and Leighton 2010); however, because the vertical APE is only approximately 3.5 feet there is a very low likelihood of encountering buried archaeological sites during project excavations.

Cultural Setting

Archaeological evidence indicates that human occupation of California began at least 12,000 years ago (Fredrickson 1984:506). Early occupants appear to have had an economy based largely on hunting, with limited exchange, and social structures based on extended family units. Later, milling technology and an inferred acorn economy were introduced. This diversification of economy appears coeval with the development of sedentism, population growth, and expansion. Sociopolitical complexity and status distinctions based on wealth are also observable in the archaeological record, as evidenced by an increased range and distribution of trade goods (e.g., shell beads, obsidian tool stone), which are possible indicators of both status and increasingly complex exchange systems.

At the time of European settlement, the APE was within the territory controlled by the Bay Miwok branch of the Eastern Miwok, near the boundary common to the Plains Miwok

(Kroeber 1925; Levy 1978). The Bay Miwok were hunter-gatherers in a rich environment that allowed for dense populations. They settled in large, permanent villages about which were distributed seasonal camps and task-specific sites. Primary villages were inhabited throughout the year while other sites were visited seasonally to obtain particular resources. Sites were often established near fresh water sources and at ecotones where plant and animal life was diverse and abundant. The marsh setting enjoyed by the Bay Miwok provided abundant plant and animal resources for their use.

There are no historically documented Native American sites within or adjacent to the study area (Kroeber 1932; Levy 1978). More information about the Eastern Miwok is available in Bennyhoff (1977) and Milliken (1995), and a good overview of prehistoric use of the Delta Region is found in Waugh (1986).

The Swamp Land Act of 1850 enabled California to reclaim thousands of acres of land, creating the fertile Sacramento-San Joaquin river delta's islands of agricultural fields. Levee construction on Sherman Island began in the late 1850s, and the island was reportedly reclaimed by 1873 (Thompson and West 1890:220). The early levees were built by hand primarily using Chinese labor. These low, peat levees proved inadequate for heavy winter flooding. Sherman Island flooded regularly, and by the late 1870s the early levees were destroyed. After the initial phase of reclamation, steam dredges were put into action and new levees were built that were taller and stronger, and able to better withstand the heavy flooding. Strengthening the levees is an ongoing activity. Agriculture and recreation have been the primary uses of Sherman Island, typical of the Sacramento-San Joaquin delta region.

STUDY PROCEDURES AND RESULTS

Archival Study Procedures

Archival research included examination of the library and project files at Tom Origer & Associates, and the archaeological site base maps and records, survey reports, and other materials on file at the North Central Information Center (NCIC), Sacramento State University (NCIC File SAC-13-69). Sources of information included but were not limited to the current listings of properties on the National Register of Historic Places, California Historical Landmarks, California Register of Historical Resources, and California Points of Historical Interest as listed in the Office of Historic Preservation's *Historic Property Directory* (OHP 2012). In addition, ethnographic literature, county histories, and other primary and secondary sources were reviewed. Sources reviewed are listed in the "Materials Consulted" section of this report.

The State Office of Historic Preservation has determined that structures in excess of 45 years of age should be considered to be potentially important resources, and former building and structure locations could be potentially important historic archaeological sites. Archival research included an examination of historical maps to gain insight into the nature and extent of historical development in the general vicinity, and especially within and adjacent to the study area. Maps ranged from hand-drawn maps of the 1800s to topographic quadrangles

issued by the United States Geological Survey (USGS). Included were General Land Office survey plats (1862 and 1867), an early survey of the Sacramento River (Ringgold 1852), and early USGS topographic maps (USGS 1907, 1908, 1953a, 1953b).

Archival Study Results

A search of the archaeological base maps at the NCIC found that portions of the APE have been subject to prior cultural resources surveys; however, the entire APE has not been previously surveyed (see Hagensieker and Beard 2012; Perry and Montag 2003; Schmid 2008; Wohlgemuth 2005 and 2006). These surveys resulted in the documentation of one cultural resource, the Sherman Island levee. Surveys conducted within one-quarter mile of the APE result ed in the finding of no cultural resources (Ambacher 2013; Beard 2008 and 2012; Gilbert 2013; Hagensieker and Beard 2012; Leach-Palm *et al.* 2008; Theodoratus Cultural Research 1980).

In 2006 JRP Historical Consulting, LLC conducted a cultural resources inventory and evaluation of historic-era structures on Sherman Island. Included in their report was an evaluation of the significance of the levee surrounding the island (JRP Historical Consulting, LLC 2006). They concluded that the levee did not meet criteria for listing in the NRHP or on the CRHR because it lacks integrity. Thus, there are no historic properties within the APE.

Review of the ethnographic literature found no reported ethnographic village sites within or near the study area (Barrett 1908; Levy 1978; Kroeber 1925).

There are no local, state, or federally recognized historic properties within or adjacent to the APE (OHP 2012; State of California Department of Parks and Recreation 1976). With the exception of the Sherman Island levee system, the 1907 USGS topographic map is the earliest map showing buildings within the APE. A total of ten buildings on lands adjacent to the landward side of the levee are shown, with seven of those being within the APE. Two of these buildings within the southeast corner of the APE and an additional building just outside the southeast corner of the APE are named Wood-Curtis Landing. Later maps show these buildings as Amelia Landing (USGS 1953a and 1953b). By 1953, only one building is shown at Amelia Landing, and none of the other buildings in or adjacent to the APE are shown at all, suggesting they were no longer standing then.

Native American Contact

A letter was sent to the State of California's Native American Heritage Commission seeking information from their sacred lands files, which track Native American cultural resources . Letters were also sent to individuals and groups that the Native American Heritage Commission considered it appropriate to contact regarding this project, including:

Rhonda Morningstar Pope, Buena Vista Rancheria
Anthony Burris, Ione Band of Miwok Indians

Yvonne Miller, Ione Band of Miwok Indians
Andrew Franklin, Wilton Rancheria
Steven Hutchason, Wilton Rancheria
Randy Yonemura

The Native American Heritage Commission responded with a letter dated June 19, 2013 , in which they indicated that the sacred land file has no information about the presence of Native American cultural resources in or near to the APE. A log of contact efforts and copies of correspondence are provided at the end of this report (Appendix A).

Field Survey Procedures

A intensive survey of the APE was completed by Yesenia Chavez, Lauren Del Bondio, Tom Origer, and Sue Ann Schroder on June 19 through the 21 , 2013. Visibility ranged from good to poor with standing water and vegetation being the chief hindrances. Where needed, h oes were used to clear small patches of vegetation so that the ground surface could be inspected. A special examination was made of the building locations shown on historical maps as being within the APE.

Prehistoric archaeological site indicators expected to be found in the region include but are not limited to: obsidian and chert flakes and chipped stone tools; slabs and handstones, and mortars and pestles; and locally darkened soils containing some of the previously listed items plus fragments of bone, shellfish, and fire affected stones. Historic period site indicators generally include: fragments of glass, ceramic, and metal objects; milled and split lumber; and structure and feature remains such as building foundations and discrete trash deposits (e.g., wells, privy pits, dumps).

Field Survey Results

Archaeology. One piece of ceramic was found at the location of one of the buildings shown on historical maps. Nothing further was found at this location or any of the other locations. No archaeological resources were found within the APE.

Built Environment. No buildings were found within the APE. Buildings shown on the early 20th century USGS maps within the APE are no longer extant, probably due to improvements (i.e., widening) made to the levees. The Sherman Island levee was originally constructed in the 1850s; however, it appears that the levee has been enhanced and repaired many times over the past 160 years. The levee was concluded to be ineligible for the CRHR and the NRHP by JRP Historical Consulting, LLC (2006) and our stud y found nothing that would contradict that assessment.

FINDINGS AND RECOMMENDATIONS

No historic properties were identified during this study, and no resource specific recommendations are warranted.

Accidental Discovery

Although a low likelihood, if buried materials are encountered, all soil disturbing work should be halted at the location of any discovery until a qualified archaeologist completes a significance evaluation of the find(s) pursuant to CEQA (§15064.5 [f]) and Section 106 of the National Historic Preservation Act (36CFR60.4). Prehistoric archaeological site indicators that might be found within the general area include: chipped chert and obsidian tools and tool manufacture waste flakes; grinding and hammering implements that look like fist-size, river-tumbled stones; and for some rare sites, locally darkened soil that generally contains abundant archaeological specimens. Historical remains that have been found in the general area commonly include items of ceramic, glass, and metal. Features that might be present include structure remains (e.g., cabins or their foundations) and pits containing historical artifacts.

The following actions are promulgated in the CEQA Guidelines Section 15064.5(d) and pertain to the discovery of human remains. If human remains are encountered, excavation or disturbance of the location must be halted in the vicinity of the find, and the county coroner contacted. If the coroner determines the remains are Native American, the coroner will contact the Native American Heritage Commission. The Native American Heritage Commission will identify the person or persons believed to be most likely descended from the deceased Native American. The most likely descendent makes recommendations regarding the treatment of the remains with appropriate dignity.

SUMMARY

Tom Origer & Associates conducted a historic properties survey of approximately 900 acres of a portion of Sherman Island, as requested by Aaron Will, of Ducks Unlimited. No historic properties were found within the APE, and no resource-specific recommendations were made.

MATERIALS CONSULTED

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APPENDIX A

Native American Contact

Native American Contact Log
Copies of Correspondence

Native American Contact Efforts
Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project,
Sacramento County

Organization	Contact	Letters	Results
Native American Heritage Committee	Debbie Pilas-Treadway	6/13/13	Letter received 6/19/13 NAHC has no information about resources in the immediate project area.
Buena Vista Rancheria	Rhonda Morningstar Pope	6/19/13	No response received as of the date of this report.
Ione Band of Miwok Indians	Anthony Burris Yvonne Miller	6/19/13	No response received as of the date of this report.
Wilton Rancheria	Andrew Franklin Steven Hutchason	6/19/13	No response received as of the date of this report.
NA	Randy Yonemura	6/19/13	No response received as of the date of this report.

Sacred Lands File & Native American Contacts List Request

NATIVE AMERICAN HERITAGE COMMISSION
915 Capitol Mall, RM 364
Sacramento, CA 95814
(916) 653-4082
(916) 373-5471 – Fax
nahc@pacbell.net

Information Below is Required for a Sacred Lands File Search

Project: Sherman Island - Whale's Mouth Subsidence Mitigation Funding Agreement Project (Project No.: US-CA-437-3)

County: Sacramento

USGS Quadrangles

Name: Antioch North
Township _3N_ Range_2E_ Section(s) N/A (within Sherman Island)

Company/Firm/Agency: Tom Origer & Associates
Contact Person: Eileen Barrow

Street Address: P.O. Box 1531
City: Rohnert Park Zip: 94927
Phone: (707) 584-8200 Fax: (707) 584-8300
Email: eileen@origer.com

Project Description:
Ducks Unlimited is proposing to conduct wetland restoration work on a portion of Sherman Island.

Tom Origer & Associates
Archaeology / Historical Research

June 19, 2013

Rhonda Morningstar Pope
Buena Vista Rancheria
P.O. Box 162283
Sacramento, California 95816

Re: Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project, Sacramento County, California

Dear Ms. Pope:

I write to notify you of a cultural resources study that our firm is conducting for the proposed Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project, Sacramento County, California. The project area is shown on the enclosed portions of the Antioch North, California 7.5' USGS quadrangle within Township 3 North, Range 2 East.

While this notification does not constitute SB 18 or formal Section 106 consultation, if you have any information or concerns we would be happy to convey them to our client.

Please contact us if you need any additional information. Thank you for your help.

Sincerely,

Eileen Barrow
Associate

P.O. Box 1531, Rohnert Park, California 94927 ♦ Phone (707) 584-8200 Fax (707) 584-8300

Tom Origer & Associates
Archaeology / Historical Research

June 19, 2013

Anthony Burris
Ione Band of Miwok Indians
P.O. Box 699
Plymouth, California 95669

Re: Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project, Sacramento County, California

Dear Mr. Burris:

I write to notify you of a cultural resources study that our firm is conducting for the proposed Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project, Sacramento County, California. The project area is shown on the enclosed portions of the Antioch North, California 7.5' USGS quadrangle within Township 3 North, Range 2 East.

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Sincerely,

Eileen Barrow
Associate

P.O. Box 1531, Rohnert Park, California 94927 ♦ Phone (707) 584-8200 Fax (707) 584-8300

Tom Origer & Associates
Archaeology / Historical Research

June 19, 2013

Yvonne Miller
Ione Band of Miwok Indians
P.O. Box 699
Plymouth, California 95669

Re: Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project, Sacramento County, California

Dear Ms. Miller:

I write to notify you of a cultural resources study that our firm is conducting for the proposed Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project, Sacramento County, California. The project area is shown on the enclosed portions of the Antioch North, California 7.5' USGS quadrangle within Township 3 North, Range 2 East.

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Please contact us if you need any additional information. Thank you for your help.

Sincerely,

Eileen Barrow
Associate

P.O. Box 1531, Rohnert Park, California 94927 ♦ Phone (707) 584-8200 Fax (707) 584-8300

Tom Origer & Associates
Archaeology / Historical Research

June 19, 2013

Andrew Franklin, Chairperson
Wilton Rancheria
9300 W. Stockton, Suite 200
Elk Grove, California 95758

Re: Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project, Sacramento County, California

Dear Mr. Franklin:

I write to notify you of a cultural resources study that our firm is conducting for the proposed Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project, Sacramento County, California. The project area is shown on the enclosed portions of the Antioch North, California 7.5' USGS quadrangle within Township 3 North, Range 2 East.

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Sincerely,

Eileen Barrow
Associate

P.O. Box 1531, Rohnert Park, California 94927 ♦ Phone (707) 584-8200 Fax (707) 584-8300

Tom Origer & Associates
Archaeology / Historical Research

June 19, 2013

Steven Hutchason, Director of Cultural Preservation
Wilton Rancheria
9300 W. Stockton, Suite 200
Elk Grove, California 95758

Re: Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project, Sacramento County, California

Dear Mr. Hutchason:

I write to notify you of a cultural resources study that our firm is conducting for the proposed Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project, Sacramento County, California. The project area is shown on the enclosed portions of the Antioch North, California 7.5' USGS quadrangle within Township 3 North, Range 2 East.

While this notification does not constitute SB 18 or formal Section 106 consultation, if you have any information or concerns we would be happy to convey them to our client.

Please contact us if you need any additional information. Thank you for your help.

Sincerely,

Eileen Barrow
Associate

P.O. Box 1531, Rohnert Park, California 94927 ♦ Phone (707) 584-8200 Fax (707) 584-8300

Tom Origer & Associates
Archaeology / Historical Research

June 19, 2013

Randy Yonemura
4305 39th Avenue
Sacramento, California 95824

Re: Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project, Sacramento County, California

Dear Mr. Yonemura:

I write to notify you of a cultural resources study that our firm is conducting for the proposed Sherman Island - Whale's Mouth Subsidence Mitigation Funding Project, Sacramento County, California. The project area is shown on the enclosed portions of the Antioch North, California 7.5' USGS quadrangle within Township 3 North, Range 2 East.

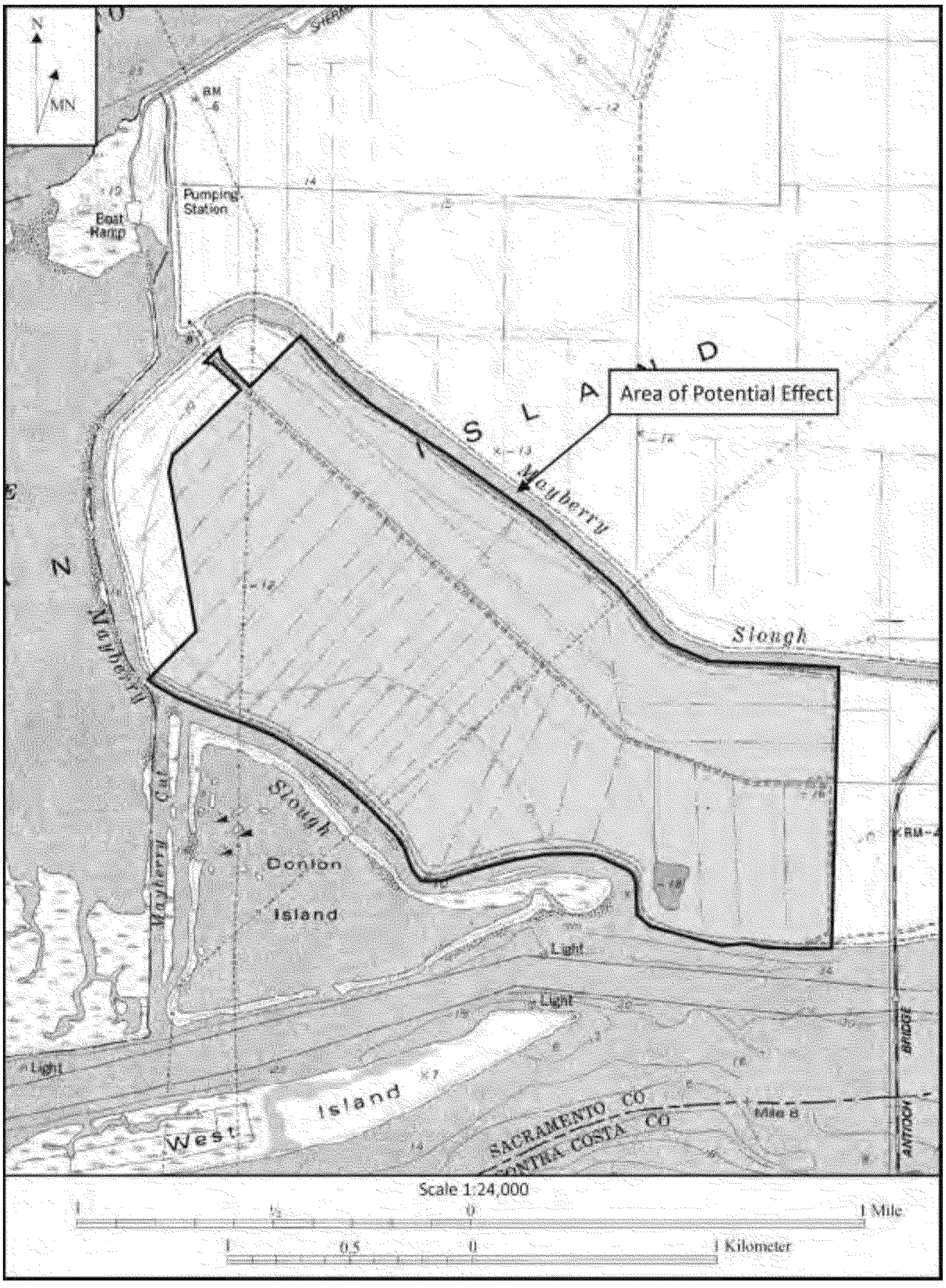
While this notification does not constitute SB 18 or formal Section 106 consultation, if you have any information or concerns we would be happy to convey them to our client.

Please contact us if you need any additional information. Thank you for your help.

Sincerely,

Eileen Barrow
Associate

P.O. Box 1531, Rohnert Park, California 94927 ♦ Phone (707) 584-8200 Fax (707) 584-8300


N
MN
Pumping Station
Boat Ramp
Area of Potential Effect
Mayberry Slough
Mowry
Slough
Canal
Connection
Slough
Conlon
Island
Light
Light
Light
West
Island
SACRAMENTO CO
CONTRA COSTA CO
Mile 8
BRIDGE
ANTIOCH
Scale 1:24,000
1 Mile
1 Kilometer

APPENDIX D
Mitigation Measures

Proposed Mitigation	Impact	Summary of Measures
IV. BIOLOGICAL RESOURCES		
MM 4.a(1)	Western pond turtle (WPT)	□ A qualified biologist shall conduct a pre-construction survey for western pond turtles no more than 30 days prior to construction in suitable aquatic habitats within the project site. A combination of visual and trapping surveys may be performed with authorization from the DFW. If the species is found near any proposed construction areas, impacts on individuals and their habitat shall be avoided to the extent feasible. If occupied habitat can be avoided, an exclusion zone shall be established around the habitat and temporary plastic fencing shall be installed around the buffer area with "Sensitive Habitat Area" signs posted and clearly visible on the outside of the fence. If avoidance is not possible and the species is determined to be present in work areas, the biologist with approval from DFW may capture turtles prior to construction activities and relocate them to nearby, suitable habitat a minimum of 300 feet from the work area. Exclusion fencing should then be installed if feasible to prevent turtles from reentering the work area. For the duration of work in these areas the biologist should conduct monthly follow-up visits to monitor effectiveness. □ If a WPT nest is found during surveys, the access route and staging area will be located so as to provide a 100-foot buffer around any nest. The 100-foot buffer will be marked with stakes and flagging, and DFW will be consulted on how to proceed. □ Aquatic habitat in drainage ditches that will be disturbed or removed will be dewatered to the extent feasible at least fifteen days prior to the initiation of construction activities, and will be kept dry to the extent feasible until construction within 100 feet of the respective ditch has concluded. Work will be conducted in the dry, as much as is practical. If ditches contain water during construction, additional surveys will be conducted to ensure that no turtles are present in the construction zone. □ A Worker Environmental Awareness Training Program for construction personnel shall be conducted by a DFW-approved biologist for all construction workers, including contractors, prior to the commencement of construction activities. □ Contract and bid specifications will require contractor to implement best management practices (BMPs) to prevent wildlife entanglements in fencing and impacts to water quality in undrained ditches.
MM 4.a(2)	Giant garter snake	□ Within the Project Site, aquatic ditch habitat for GGS will be lowered as much as possible and then maintained as low as possible for at least fifteen consecutive days prior to the initiation of construction activities Complete dewatering is likely not possible due to the high water table and continuous levee under seepage on the Project Site. At most 24-hours prior to the commencement of construction activities, the Site shall be surveyed for giant

		garter snakes by a USFWS-approved biologist. The biologist will provide the USFWS with a written report that adequately documents the monitoring efforts within 24-hours of commencement of construction activities. The Project Site shall be re-inspected by the monitoring biologist whenever a lapse in construction activity of two weeks or greater has occurred. - A Worker Environmental Awareness Training Program for construction personnel shall be conducted by a USFWS-approved biologist for all construction workers, including contractors, prior to the commencement of construction activities. - Conducting grading, clearing, grubbing, or other similar construction-related disturbance of suitable upland habitat within 200 feet of suitable aquatic and/or wetland habitat will be conducted during the GGS active period of May 1 to October 1, when GGS are able to avoid or evade construction activities. If it appears that construction activity may go beyond October 1, the project proponents shall contact the USFWS as soon as possible, but not later than September 15 of the year in question, to determine if additional measures are necessary to minimize take. Construction activities within 200 feet from the banks of snake aquatic habitat will be avoided during the snake's inactive season. - Clearing activities will be confined to the minimum necessary to facilitate construction activities. - Project-related vehicles will observe a twenty mile-per-hour speed limit within construction areas, except on existing paved roads where they will adhere to the posted speed limits. - If a snake is encountered during construction activities, all activities will cease and the USFWS will be notified immediately to determine the appropriate procedures related to the collection and relocation of the snake. A report will be submitted to the USFWS and will include the date(s), location(s), habitat description, and any corrective measures taken to protect the snake, within one (1) business day. The applicant is required to report any take of listed species to the USFWS immediately by telephone at 916-930-5603 and by electronic mail or written letter addressed to the Assistant Field Supervisor, ESA/Regulatory Division of the BDFWO, within one (1) working day of the incident. - Contract and bid specifications will require contractor to implement best management practices (BMPs) to prevent wildlife entanglements in fencing, and impacts to water quality in undrained ditches. These shall include all food-related trash items (e.g., wrappers, cans, bottles, and food scraps) will be disposed of in closed containers and removed at the end of each workday.

MM 4.a(3).	Swainson's hawk, White-tailed kite, , Loggerhead shrike, Modesto song sparrow, and Migratory Birds & Birds of Prey	□ If construction is scheduled to begin between February 1 and August 31 then a qualified biologist shall conduct a preconstruction survey for active nests at the construction site and within 0.25 mile of the construction site from publicly accessible areas within 30 days prior to construction. If no active nest of a bird of prey or MBTA bird is found, then no further mitigation measures are necessary. □ If an active nest of a bird of prey or MBTA bird is found, then the biologist shall flag a minimum 250 foot (1320 ft. (0.25 mile) for Swainson's hawk) Environmentally Sensitive Area (ESA) around the nest if the nest is of a bird of prey, and a minimum 100-foot ESA around the nest tree if the nest is of an MBTA bird other than a bird of prey. □ No construction activity shall be allowed in the buffer until the biologist determines that the nest is no longer active, or unless monitoring determines that a smaller buffer will protect the active nest. □ The buffer may be reduced if the biologist monitors the construction activities and determines that no disturbance to the active nest is occurring. The size of suitable buffers depends on the species of bird, the location of the nest relative to the project, project activities during the time the nest is active, and other project specific conditions. Before any work is authorized within a buffer, DFW shall be consulted. If construction is allowed within the buffer, a biologist will be present to monitor nests and will have the authority to halt construction activities within the buffer if the nesting birds show signs of agitation or potential abandonment. Active nests with transportation routes that are within the buffer zone should be monitored for signs of distress, with routes being altered, or implementing other measures to minimize disturbances.
MM 4.c.	Jurisdictional wetland impacts	□ Project proponent shall obtain a Section 404 CWA Nationwide Permit and a Section 401 CWA Water Quality Certification for impacts to Corps jurisdictional features. The project proponent shall fulfill the requirements of the permits.

APPENDIX E

Habitat and Water Management Plan

HABITAT AND WATER MANAGEMENT PLAN

for the

Sherman Island Whale's Mouth Wetland Habitat Restoration Project

Prepared By:
California Department of Water Resources

and

Ducks Unlimited, Inc.

August 2013

INTRODUCTION

The **Sherman Island Whale's Mouth Wetland Habitat Restoration Project (Project)** will create approximately 600 acres of permanently flooded wetlands on Sherman Island. The Project will be located on property owned by the Department of Water Resources (DWR; Figure 1). The goals of the project are:

- Control and reverse subsidence by using permanent flooding techniques;
- Create wetland and riparian habitat and monitor biological enhancement;
- Provide carbon sequestration benefits and evaluate the net greenhouse gas (GHG) benefits by restoring permanently flooded emergent wetlands on highly organic soils;
- Demonstrate the applicability of tested management practices to Delta and Suisun Marsh.

The Project will provide subsidence reversal benefits and develop knowledge that can be used by operators of private wetlands, including "duck clubs," which manage lands for waterfowl-based recreation. By maintaining permanent water, the growth and subsequent decomposition of emergent vegetation is expected to control and reverse subsidence. The parcel is expected to provide year-round wetland habitat for waterfowl and other wildlife.

To achieve final restoration goals, these wetlands will be managed through a system of water supply structures (including siphons, ditches, and swales), berms to ensure proper water management depths and site access, and water outflow control structures. Proper water management is critical for establishing and maintaining healthy habitat conditions in all managed wetlands. Managing water for the appropriate time of application, duration of inundation, and depth are the three key factors to support the desired vegetation and wildlife communities in a managed marsh. The restored permanent wetlands will require regular and attentive water deliveries, draw downs, and overall management to achieve the project's goals.

Throughout the year, water levels will be managed to encourage the establishment and maintenance of annual, perennial, emergent, and submerged aquatic vegetation. Subsequently, these vegetation communities will provide habitat for a variety of wetland dependent wildlife. Water management provides the means to vary water levels within and between units to distribute nutrients, decrease stagnant conditions, provide quality habitat, and minimize vector production.

PROJECT SUMMARY

The Project Site is located on Sherman Island Assessor's Parcel Number 158-0090-016-0000, in southwest Sacramento County, CA and is shown on the Antioch North, CA USGS topographic quadrangle. This un-sectionalized portion of Sherman Island would be considered to be generally located within Sections 4, 5, 8, and 9, Township 2N Range 2E. This land is owned by the Department of Water Resources (DWR).

Sherman Island is approximately 10,000-acre island in the western Delta approximately 70 mi southwest of the City of Sacramento. Historically, the project area was a marsh that was diked off from the Sacramento River and drained between 1850 and 1873 to facilitate agriculture. As a result of more than 130 years of farming practices, irrigation, and exposure of soils to air, the project area has subsided as much as 20 ft. A high water table currently makes the Project Site unsustainable as a long-term agricultural area.

Before the Delta was diked, drained, and farmed, it was subject to significant seasonal fluctuations in freshwater inflows, which worked in concert with large tidal ranges. Natural levees were formed by sediments deposited during spring floods and stabilized by vegetation. Dominant vegetation within the natural levees included tules - marsh plants that live in fresh and brackish water. Decomposing tules and reed vegetation formed the peat soils over thousands of years. In waterlogged conditions, decaying tules decompose slowly to release carbon dioxide and methane, which is trapped in the soils by water. Once the soil was diked and then dried, the peat soils decompose, which leads to compaction and subsidence.

Subsidence has reduced the distance from the soil surface to the water table. The resulting high water table makes the Site unsustainable for crop production, although much of the Site is currently used for corn production and pasture.

Recent environmental concerns in the Delta have prompted DWR to re-evaluate how properties in the region are managed. DWR is particularly interested in incorporating land-use practices that reduce or reverse subsidence. Research has shown that wetlands that are permanently flooded halt and can reverse subsidence, as well as sequester GHG. Therefore, DWR is interested in restoring the entire project site back to the palustrine emergent wetland type that existed in the early part of last century. In addition, subsidence reversal and GHG in the project area will be monitored and evaluated with the hope of undertaking similar projects elsewhere in the Delta. Management of the restored wetlands will be undertaken by DWR and/or a wetland manager.

The project will restore palustrine emergent wetlands and enhance existing emergent wetlands on site by upgrading existing and installing new water management infrastructure including berms, seasonally flooded islands, water control structures, and water conveyance channels on site. When the project is completed, water will be maintained in the project area year-round. Restoring permanent wetlands on Delta islands has been shown to halt and reverse subsidence. This project will combine the wildlife benefits of wetland restoration with the importance of reversing Delta island subsidence. All earthwork associated with the project is scheduled to begin in May 2014 and be completed by October 2014. Planting will commence during the fall of 2014 and continue through spring 2015. All work will be done within the Site.

Proper water management is critical for maintaining healthy habitat conditions in all managed wetlands. This permanent wetland will require regular and attentive water deliveries, draw downs, and overall management to achieve the project goals. Water depths, duration of inundation, and timing of flooding are the three key features of water management and all contribute to support the desired vegetation and wildlife communities.

WATERFOWL REQUIREMENTS

The Project will be managed to provide a variety environmental functions and values. One of those is wildlife habitat, particularly for breeding and wintering waterfowl. This project differs from other traditional Central Valley waterfowl areas in that it has been designed to maintain permanent vegetation and open water areas throughout. While permanent emergent wetlands are less productive for wintering waterfowl than seasonal wetlands, permanent emergent wetlands provide greater benefit for breeding waterfowl.

Breeding Season

California's breeding duck population is dominated by mallards, although wood ducks, gadwall, and cinnamon teal ducks are also common nesters in the Central Valley. These dabbling ducks need three primary habitat types for successful breeding: pair water, upland nesting areas, and brood water. When properly managed, the site will have an appropriate mixture of permanent wetland vegetation and open water with adjacent upland nesting habitats to encourage waterfowl reproduction.

Pair water refers to habitats used by breeding ducks while establishing territories and accumulating fat and protein reserves prior to nesting. These areas are typically used as brood ponds later in the season. Pair water typically consists of shallow ponds adjacent to upland nesting areas that have abundant invertebrate populations.

Waterfowl nesting occurs between early March and mid-June in upland vegetation adjacent to permanent water. Desirable nesting cover for most waterfowl consists of robust vegetation of approximately 12 inches or more in height within several hundred feet of permanent water. Although hens rely primarily on body reserves for energy during nesting, they do take "nest breaks" to feed.

Upon successfully hatching a clutch, hens lead their hatchlings to nearby brood water. Here, hens rely on invertebrates as their primary food source for rebuilding body mass depleted from egg laying, while ducklings rely on invertebrates for the next several months during their period of rapid growth prior to fledging. Wetlands with adequate cover and abundant invertebrate food supplies are necessary for optimal hatchling survival. Relatively tall wetland plants such as cattails (*Typha* sp.), tules (*Schoenoplectus acutus* or *californicus*), and other robust emergent vegetation provide cover for many species of wildlife, particularly young ducklings, which need to be able to escape predators.

Wintering Season

Upwards of 4 to 5 million waterfowl winter in the Central Valley. While the areas of the Sacramento Valley near the Sutter Buttes and the Grasslands region of the San Joaquin Valley traditionally support the majority of these birds, wetland habitats in the Delta region are also important. The most productive habitat for wintering waterfowl in the Central Valley is managed seasonally flooded marsh, or moist soil wetlands. These managed habitats support abundant high-calorie seed sources.

Wintering waterfowl have two main habitat requirements: areas with high-calorie foods and resting areas. The Delta region was historically permanently flooded marsh with dense emergent vegetation. This vegetation was dominated by hard-stem bulrush, or tules. While tules do not produce as many energy rich seeds as seasonal wetland plants, they nevertheless provide quality food sources and sheltered resting areas that are protected from storms and predators. Other quality plant food sources in permanent wetlands are submerged aquatic vegetation including widgeon grass and sago pondweed. These plants grow in deeper water than emergent vegetation and have extremely rich seeds, tubers, and associated invertebrate food resources.

Dense tule stands can also provide sheltered rest areas that are protected from storms and predators. Ponds, sloughs, and channels lined with tules are good foraging areas and also make excellent resting areas.

These food sources supply the energy needed to replenish waterfowl body fat reserves following fall migration and to build additional fat reserves to fuel the upcoming spring migration. Wintering waterfowl need to conserve energy as much as possible. Waterfowl that are frequently disturbed lose energy quickly from the demands of taking flight.

WATER MANAGEMENT INFRASTRUCTURE AND MAINTENANCE

Infrastructure

The Project site is divided into four separate wetland management units (Figure 3). Each unit is separated from the other units and the adjacent properties by a berm. This allows for flexibility for maintaining, raising, or drawing down water within and between each unit.

Approximately 27 water control structures will be installed. The interior of the site will be divided up into 7 managed wetland units, separated by 47,000 lineal feet of proposed interior berms, and crossed with conveyance swales, in order to facilitate appropriate water and vegetation management capabilities. Water levels in each unit will be managed independently to restore the desired emergent wetland conditions throughout the site. When the project is completed, water is proposed to be maintained in the project area year-round, effectively creating a permanent wetland.

Water will be conveyed within the wetland system via gravity flow from the higher elevation units to the lower elevation units until it finally makes its way back to the District's drainage canal, to the east of the project boundary. The ultimate outcome of the restoration project will be approximately 600 acres of freshwater emergent wetlands. Each wetland unit will be a mosaic of open water channels and emergent vegetation comprised predominantly of species such as California bulrush (*Schoenoplectus californicus*) and narrow leaved cattails (*Typha angustifolia*). Other native plant restoration components will include installation of native trees and shrubs compatible with their respective hydrologic regime as well as a substantial amount of upland transitional area, all of which will provide great diversity and increased habitat opportunity for wildlife.

Interior water conveyance channels will be excavated in the wetland management units to provide water delivery and circulation to all areas of the Site. The conveyance channels will provide numerous wetland and wildlife benefits to the project area. Material excavated to construct the channels will provide material for the buttress berm and the interior and perimeter berms. Construction of conveyance channels will convert existing wetland and upland areas into permanent open water that will facilitate water conveyance.

The channels will be managed to encourage the growth of submerged aquatic and floating wetland vegetation and discourage the growth of invasive species. Open water areas will provide waterfowl with areas to land, loaf, and feed. It is anticipated that the presence of permanent open water will increase the amount of waterfowl breeding and brood rearing in the project area.

Conveyance channels will have an approximately 15-ft wide bottom with gradual, 5:1 side slopes. Most of the existing agricultural drainage ditches on Sherman Island have rectangular configurations. A gradual channel side slope will allow for easy wildlife movement across the channels while reducing channel erosion by encouraging vegetation growth along the channel's edges. Depth of channel excavation will vary depending on existing topography.

In addition to the channels, larger open water areas will also be created through excavation. These larger open water areas will be connected to the conveyance channels and have the same bottom elevations. They will serve as waterfowl brood rearing areas in the spring and loafing/storm-shelter locations in the winter. Material borrowed from these areas will be incorporated into the interior and perimeter berms or used to construct loafing islands.

Water to the site will be delivered by existing gravity siphons along the San Joaquin River Levee. These siphons have fish screens that are maintained by the District and DWR. At this time it is anticipated that siphons 1, 2, 3 and 4 (as shown if figure 3) will be utilized as the primary source of water. Siphon 1 is a 14 inch pipe that is capable of discharging approximately 3000-3500 gallons per minute. Siphon 2 is a 12 inch pipe that is capable of discharging approximately 2500-3000 gallons per minute. Siphon 3 is a 12 inch pipe that is capable of discharging approximately 2500-3000 gallons per minute. Siphon 4 is a 10 inch pipe that is capable of discharging approximately 1750-2200 gallons per minute. Water will be conveyed within the wetland system via gravity flow from the higher elevation units to the lower elevation units until it finally makes its way back to the District's drainage canal, approximately 3,400 feet north of the proposed pumping station.

Improvements to the outlet of the functional siphon may include replacing outlet valves, installing flow meters, and installing additional appurtenances as needed to improve the control of the water supply to the Site. All siphon improvements will take place on the interior (land) side of the San Joaquin River levee. Water delivered to the Site will circulate through the system to maintain appropriate water quality conditions and prevent stagnation.

Several existing agricultural drainage ditches occur within the interior and exterior of the Site. These ditches connect to the master drainage system of the western portion of Sherman Island. The drainage ditches within the proposed project boundaries will be incorporated into the internal water conveyance system (swale system). A ditch along the exterior perimeter on the western, northern and southern sides of the restoration area will be constructed to ensure drainage from the surrounding landscape, and will include proper drainage for the District's toe ditches.

Maintenance

The project's water management infrastructure is designed for durability although some annual and regular maintenance will be required. The siphons will be inspected frequently (several times a week during irrigation months) to ensure efficient operation. Flash board riser water control structures will require periodic inspections to ensure proper and efficient water management.

Both interior and exterior berms must be inspected for evidence of erosion around water control structures and outlet pipes. Additional inspection of berms and levees is required to identify any holes. Animal burrows and other holes should be repaired and filled immediately to prevent berm failure. Drainage and supply ditches will be maintained and cleaned as needed to allow for efficient water flow.

WATER MANAGEMENT GUIDELINES

Proper water management in any managed wetland is essential for providing quality wetland conditions that support the desired functions and values. Water depths, timing, and duration of

inundation, dictate the vegetation community present in any wetland. In a managed wetland, a pre-determined hydrologic regime can be implemented to produce a particular vegetation community and provide the conditions necessary to support the desired wildlife community.

Desired Wetland Condition

Proper vegetation composition and distribution is necessary for controlling subsidence, sequestering GHG, and minimizing vector production. For this project, the optimal vegetation community will be composed of a mixture of cattails and bulrush as these plants are adapted to withstand persistent flooded conditions. Vegetation density should be maximized to control and reverse subsidence. Conversely, open areas are desirable for waterfowl habitat and vector control. To balance these objectives, the established wetland vegetation community should have up to 70% vegetative cover to ensure sufficient open water pathways throughout the entire site. Each wetland management unit will have a varying ratio of vegetation to open water depending on ground elevations and maximum water surface elevations.

A permanently flooded wetland structure achieves multiple objectives. Subsidence control and reversal is achieved through persistent flooded conditions and robust emergent vegetation. Wildlife habitat is improved by providing a diverse mixture of open water and vegetation. Mosquito and vector control is facilitated with multiple open water areas, which provides access for treatment. Waterfowl hunting is facilitated by providing foraging areas, hunter access throughout the marsh, and providing waterfowl resting areas.

Water Depths, Duration, and Timing

The project will be managed to achieve a relatively constant water level that will provide the desired vegetation/ open water distribution. However, during the project's first year, water will be managed substantially different than subsequent years to encourage the rapid establishment of desirable wetland vegetation. Water depths for the first growing season will be managed to provide optimal germination conditions for cattails and tules on approximately 40% of the area of each wetland management unit. The first several months of the growing season will be critical for monitoring and evaluating the germination extent and rate. Water levels must be managed at first to encourage and then limit germination in order to achieve the desired vegetation to open water ratio.

Precise and careful management of unit water surface elevations is essential to prevent establishment of robust vegetation across the entire unit. When germination reaches the desired coverage, water levels will be raised to prevent additional germination while not drowning the new growth. During this time, germination will be evaluated weekly and water levels adjusted accordingly. If the desired vegetation coverage is not achieved during the first year, this procedure will be followed each successive year until the desired vegetation community is achieved.

Following the establishment of the desired vegetation community, water levels will be managed consistently on an annual basis to maintain wetland vegetation consistent with the project's goals.

Sherman Island Drainage System

Reclamation District 341 is responsible for the operation and maintenance of the drainage system within Sherman Island. This infrastructure consists of a network of drainage ditches and discharge pumps. The Project is part of the western drainage sub-system for the Island. This

ditch network collects surface and groundwater from the western half of Sherman Island then channels it to the pumping station on the southwestern side of the island and ultimate discharge into the Sacramento River. The ditches surrounding the project will drain into the existing main ditch on the eastern edge of the site and drain back into the District's main drainage canal. This ditch connects directly to the pump station (Figure 2).

VEGETATION MANAGEMENT

Regular maintenance of the desired wetland vegetation will be necessary following its successful establishment. The project's goal for a permanent wetland condition supporting quality wildlife habitat can only be achieved in the long-term through proper maintenance and management of both wetland and upland vegetation. Ideally, the project should require only minimal management of wetland vegetation and limited annual management of upland vegetation. The desired wetland vegetation community consists of approximately 70% vegetative cover from cattails and tules along with seasonal wetland vegetation located on the islands and submerged aquatic vegetation in the deeper water. The desired upland vegetation is perennial and annual grasses and forbs on the perimeter and interior berms and uplands.

Flooding for Emergent Vegetation

Wetland vegetation management through control of water depths is the most effective tool for controlling vegetation growth in permanent wetlands. This tool not only provides the conditions for optimal spread of desirable vegetation, but can also limit its spread to create the desired mixture of emergent vegetation to open water. In general, water depths of less than 12 inches during the growing season will promote seed germination and have little control of rhizomatous vegetation. Water depths in this range are optimal to encourage the growth of emergent vegetation. Water depths between 12 and 36 inches will prevent germination but allow for the spread of vegetation by rhizomes. Once the desirable vegetation community is established, water depths during the summer season should be maintained in this range to limit continued spread of emergent vegetation. Water depths of greater than 36 inches will prevent seed germination as well as the spread of emergent vegetation via rhizomes. Persistent water depths of greater than 36-inches during the growing season will eventually eliminate emergent vegetation from these deep flooded areas. Water depths in the conveyance channels should be maintained in this range to maintain water conveyance capabilities.

Draw Downs

Wetland draw downs are an important management tool for permanent wetlands. Draw downs reinvigorate wetland nutrient cycles and stimulate vegetation growth. A wetland under draw down conditions mimics a drought cycle. Draw downs will depend on site conditions and may not be necessary for a period of up to 7 years following establishment of desired vegetation community. Within this time frame, the wetland units should be drawn down on a rotational basis where not more than one unit drawn down at any one time. This will ensure that adequate habitat remains available on most of the site.

Beginning the fourth year following the establishment of the desired vegetation community, each wetland unit should be drawn down and completely dried on a rotating schedule for several months of the growing season (May through September). This management technique would occur every 5-7 years to reinvigorate the marsh, to control problematic vegetation by mowing or herbicide application, as a best management practice to limit mosquito production, and/or to repair berms and water control structures as needed.

Habitat Islands and Riparian Vegetation

Habitat islands are an important component of the Project. Islands have a diverse array of species, habitat structure and eco-tones. As such, careful consideration of flooding depths and duration must be evaluated for each unit during fluctuation of water levels. Generally, Tules respond faster to water fluctuations than trees or shrubs. Due to the rhizome root system, if Tules are flooded out by depths greater than 2.5-3 feet, populations can recover quickly by reducing the flooding depth and promoting new germination. However, with woody species the flooding tolerances are less. Generally, wetland tree and shrub species as well as riparian species prefer saturated to slightly inundated condition. Surface water conditions resulting in significant flooding of trees and shrubs for durations longer than a several days in the summer and a few weeks during the winter months may kill woody species permanently. This may be necessary for long term increases in water depths for subsidence reversal purposes. However, increases in water depths for non-native invasive species control and or promotion of other native wetland plant communities should be limited to the tolerable constraints of the woody species during normal practices. A good indicator of the limits of tolerable conditions can be noted by observing signs of stress from the trees and shrubs located in the deepest flooded areas of each unit. Signs of stress can include yellowing or browning of leaves, twig dieback or buds failing to open.

It is anticipated that over the course of many years, through accretion that the upland portions of habitat islands will eventually be transformed into wetland habitat. This planned natural progression will likely continue to provide habitat diversity as it will become a deciduous forested and deciduous scrub-shrub wetland habitat amongst a larger area of emergent wetland.

Irrigation of Islands

During hot summer months when irrigation water is readily available, increasing surface water elevations to irrigate habitat islands may be beneficial for tree, shrub and herbaceous species survival as well as non-native species control. After vegetation establishment, surface water elevations should be increased by 0.5 to 1 foot for about 1 week during summer months. The irrigations will also help control upland invasive species like Himalayan blackberry (*Rubus armeniacus*), perennial pepperweed (*Lepidium* sp.), and cocklebur (*Xanthium strumarium*).

Supplemental Planting

Mortality of planted woody species, generally between 20-50 percent, is common for restoration projects. It is very extremely important to replant areas that are prone to erosion in order to establish a diverse vegetative component throughout the project area. Supplementing transitional areas such as berms and islands with additional plantings can be achieved during normal maintenance of berms. Typically, willow tree and shrub branches will need to be trimmed along the access portions of the berms. This maintenance should be conducted during the late fall and winter months when possible. During these months branches can be cut into "Stakes" which can then be planted in areas where additional plantings are desired.

Mowing and Herbicides

Mechanical and chemical removal of problematic vegetation is an important component for habitat management. Wetland vegetation will need to be controlled if plant coverage expands beyond 80% or if the swales and potholes become overgrown with emergent vegetation. Aerial photos can be used to evaluate the percentage of vegetation coverage. Any unit with a vegetation problem will need to be drawn down and dried to allow mower access.

Upland vegetation on the tops of berm should be mowed annually to provide vehicular access to water control structures for regular maintenance, and access by larger equipment for special maintenance needs. Upland vegetation should not be mowed during the avian nesting season between March 1 and June 30.

Annual control of weedy vegetation will be required on annual basis to promote the desired wetland and upland vegetation communities and avoid and control exotic/invasive species. These exotic/invasive species include Himalayan blackberry (*Rubus armeniacus*), common reed (*Phragmites australis*), perennial pepperweed (*Lepidium* sp.), cocklebur (*Xanthium strumarium*), and other species as identified in the field. Each of these species has the capability to overtake both wetland and upland communities. Deeper water levels within the wetland area will help to control the spread of these species. These species can be problematic if not controlled vigorously along the edges of the wetland areas. In areas in which mowing is not practical, chemical control using an herbicide labeled for application in wet environments is recommended. Glyphosate formulated herbicides are effective for controlling annual weeds as well as common reed if applied correctly. Perennial pepperweed can be controlled with imazapyr or chlorsulfuron formulated herbicides. Himalayan blackberry can be controlled using triclopyr in dry areas. All herbicide applications must follow application rates and procedures identified on the packaging label, and will be applied by a certified/licensed applicator.

PEST MANAGEMENT

Pest management is often a necessary management activity for manipulated wetlands in the Central Valley and Sacramento-San Joaquin Delta regions. Mammalian and invertebrate pests can be problematic for the successful operation of the project and achieving the projects goals and must be controlled when warranted.

Mammals

Wetlands and riverine habitats in the Central Valley are preferred habitats for muskrats and beavers. These rodents can damage wetland management infrastructure by burrowing into berms, levees, and around water control structures. If left unchecked, these excavations can ultimately compromise the structural integrity of the water management infrastructure.

To minimize the potential damage these rodents can have on water management infrastructure, several of the berms have been designed with 3:1 side slopes. Gradual slopes limit burrowing activity compared with steep slopes such as a 1:1. In berms constructed at 3:1 slopes, annual inspection is necessary to fill any burrows.

Beavers are instinctively drawn to the sound of flowing water. When the source of the sound is located, beavers will attempt to build a dam and halt the flow of water. Water control structures will be cleared of any debris that may prevent adequate water flow.

Mosquitoes

Wetlands in the Central Valley and Sacramento-San Joaquin Delta are well known for their capabilities to produce mosquitoes. Because of its flooded pasture land uses, Sherman Island in particular produces some of the highest numbers of mosquito larvae in the western Delta. The island is within the Sacramento-Yolo Mosquito and Vector Control District (SYMVCD). The SYMVCD regularly inspects and controls mosquito larvae on the island using larvacide control methodologies. In an effort to minimize mosquito production from this project, the SYMVCD has been an active participant in the planning process.

With the current threat of West Nile and the potential spread of the H5N1 avian influenza, using water and habitat Best Management Practices (BMPs) to limit the growth and spread of mosquitoes is important. The BMPs included in Attachment B have been incorporated and utilized during the development and long-term management of the project to minimize the growth of mosquito populations.

Figure 1. Sherman Island Whale's Mouth Wetland Restoration Project Site & Vicinity Map

Base maps: Antioch North, CA USGS 7.5 minute togographic quadrangles

Figure 2. Infrastructure Map

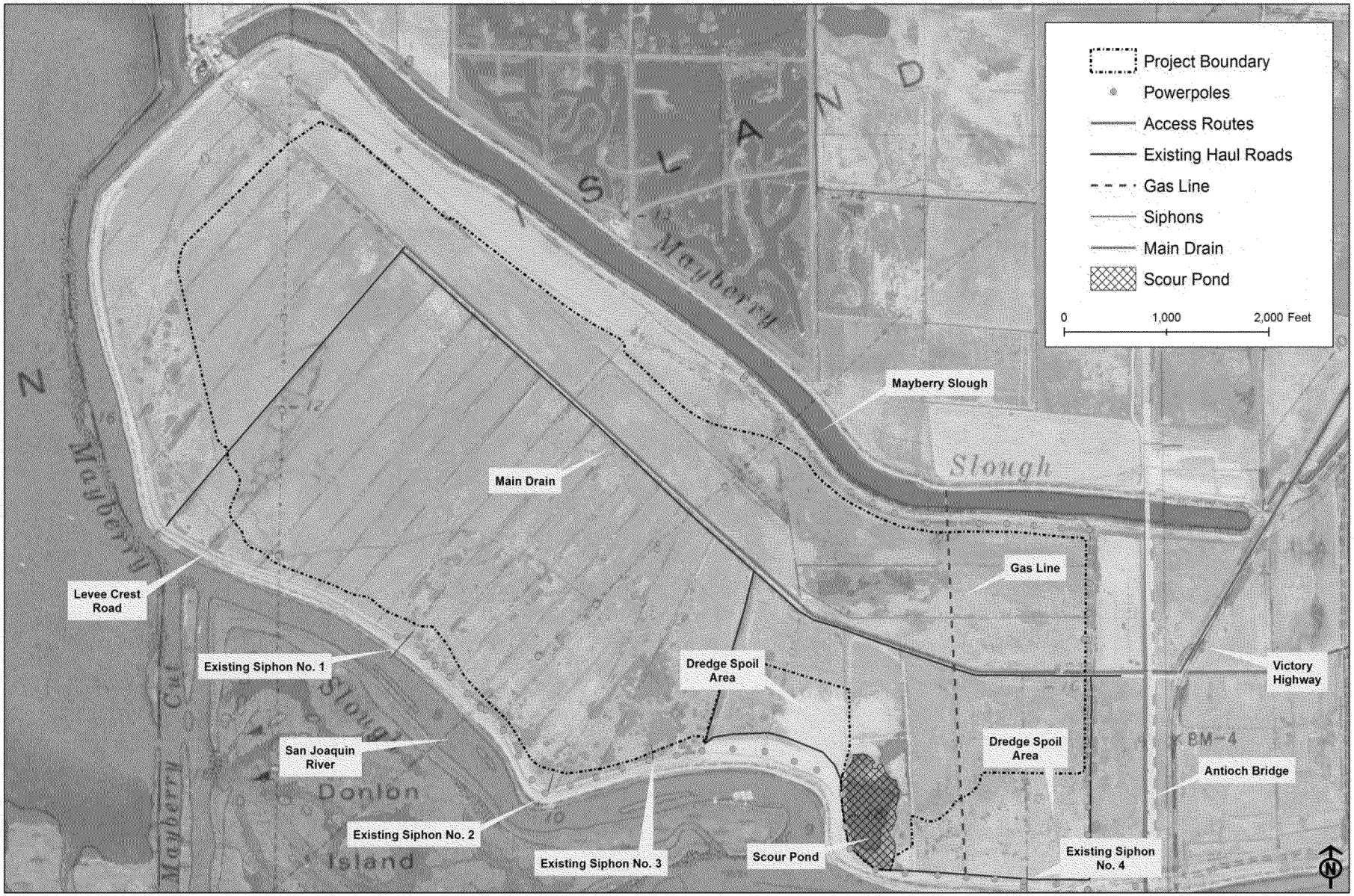


Figure 3. Restoration Plan Map

Figure 4. Sherman Island Whale's Mouth Conceptual Design

WATER BUDGET

for the

Sherman Island Whale's Mouth Wetland Habitat Restoration Project

Background

Currently, the site proposed for this wetland mitigation project is being utilized as an irrigated pasture for grazing cattle. The pasture is irrigated so that standing water occurs on much of the ground and the cattle use the standing water for drinking. In contrast, this project will convert these pastures to permanently flooded wetlands to stop and reverse the effects of subsidence. We have estimated the water requirements for the planned wetland as shown in the following tables.

Water Demand for Proposed Future Wetland

Total Demand and Components of the Water Budget

Under steady state conditions, the water budget for the proposed wetland can be represented by equation 1.

Total water demand = evapotranspiration - precipitation (1)

For equation 1, we have assumed that after the first month required to saturated the soil and flood the wetlands to the designated depths shown in Table 1, the total water demand will be equal to the components on the right hand side of equation 1. We estimated this volume as follows. It was assumed that the wetland would initially be flooded in November. The total project site is approximately 600 acres, and assuming a high groundwater table resulting in low subsurface flow, and a desired increase of water depth of on average of 1.5 feet, it was determined that 900 acre-feet would be required to saturate and flood the wetland to the specified depths during the first few months of operation. Tables 1, 2, and 3 show the components of the water budget with high low surface outflow after initial flooding and establishment of wetland vegetation.

Table 1. Components of Water Demand for Year 1

Month	Evapo transpiration	Initial Flood	Water Demand
	Acre -feet		
October	67	0	0
November	31	80	111
December	25	80	105
January	22	0	22
February	34	0	34
March	63	80	143
April	86	120	206
May	119	120	239
June	146	120	266
July	158	120	278
August	143	120	263
September	107	0	107
TOTAL	1002	840	1775

Table 2. Components of Water Demand for Year 2

Month	Evapo transpiration	Initial Flood	Water Demand
	Acre -feet		
October	67	0	67
November	31	0	31
December	25	0	25
January	22	0	22
February	34	0	34
March	63	80	143
April	86	80	166
May	119	80	199
June	146	80	226
July	158	0	158
August	143	0	143
September	107	0	107
TOTAL	**1002**	**320**	**1322**

Table 3. Components of Water Demand for Year 3+

Month	Evapo transpiration	Initial Flood	Water Demand
	Acre -feet		
October	67	0	67
November	31	0	31
December	25	0	25
January	22	0	22
February	34	0	34
March	63	0	63
April	86	0	86
May	119	0	119
June	146	0	146
July	158	0	158
August	143	0	143
September	107	0	107
TOTAL	**1002**	**0**	**1002**

Evapotranspiration

We estimated wetland evapotranspiration (ET) using the canopy cover coefficient (CCC) method[4]. In this method, wetland evapotranspiration is estimated from the reference evapotranspiration (ETo) which is calculated using meteorological data and the Standardized Penman Monteith equation and is multiplied by the wetland crop coefficient, Kc, which varies seasonally and by plant type. For Sherman Island, Anderson and Snyder[5] estimated wetland evapotranspiration using the CCC method and developed wetland crop coefficients for seasonally varying energy fluxes primarily due to varying wetland plant cover and growth stage. Drexler and others[6] described wetland crop coefficients for other geographic areas and wetland plant types. The nearest estimates to the project for ETo are calculated from data collected at the Twitchell Island California Irrigation Management System (CIMIS) weather station. There are also long-term meteorological data collected in Antioch. We used crop coefficients for Typha and Scirpus species from the Twitchell Island wetland from Anderson and Snyder and provided by Anderson (personal communication, 2008)[7]. Anderson also provided crop coefficients for open water.

For estimating evapotranspiration, we assumed the following.

- Schoenoplectus and Typha (tules and cattails) would be the primary species growing in areas flooded at depths less than 2.0 feet.
- There will be no emergent vegetation at depths greater than 2.0 feet and evaporation of open water and transpiration of tules will be the primary water loss.
- Figure 3 (provided by Ducks Unlimited) represents the distribution of vegetation and open water areas.
- Sherman Island meteorological data best represents conditions for this project.

[4] Allen RG, Hill RW, Srikanth V. 1994. Evapotranspiration parameters for variably-sized wetlands. International Summer Meeting, ASAE and ASCE, Kansas City, Missouri; 1–18.
[5] Anderson, Frank and Snyder, R.L., 2005, Twitchelll Island's restored wetland crop coefficients. Letter report to the U.S. Geological Survey from UC Davis.
[6] Drexler, Judy Z., Snyder, Richard L., Spano, Donatella and Paw U, Kyaw Tha, 1994, A review models and micrometeorological methods used to estimate wetland evapotranspiration, Hydrological Processes, 18, 2071 – 2101.
[7] Anderson and Snyder (2005) provided crop coefficient values for May – November. Frank Anderson, US Geological Survey, Sacramento, CA provided estimated for the remaining months and fro open water.

Water Demand for Wetland

To determine the wetland water demand and future planned uses for the siphons, data was used from the 2008 Habitat and Water Management plan for Mayberry Farms and compared to actual siphon flow meter numbers collected at the Mayberry Farms site. A peak wetland water demand was based on water quantities measured at Mayberry Farms in August 2012, and multiplied by 2 (300 acres vs. ±600 acres of wetland area) to accommodate for the increased size of the planned Wetland Project. The additional volumes per month were then calculated using observations from Mayberry Farms and previously established wetland demands by month.

Excerpts pertaining to permanent wetlands from:

CENTRAL VALLEY JOINT VENTURE
TECHNICAL GUIDE TO BEST MANAGEMENT PRACTICES FOR MOSQUITO CONTROL IN MANAGED WETLANDS

Dean C. Kwasny[1], Mike Wolder[2], and Craig R. Isola[2]

BEST MANAGEMENT PRACTICES

The BMPs in this document are habitat-based strategies that can be implemented when needed for mosquito control in managed wetlands. These strategies represent a range of practices that wetland managers can incorporate into existing habitat management plans or in the design of new wetland restoration or enhancement projects. Ideally, BMPs can be used to decrease the production of mosquitoes and reduce the need for chemical treatment without significantly disrupting the ecological character, habitat function, or wildlife use in managed wetlands. It should be recognized that BMPs function as a first line of defense in deterring mosquito production and can be used in combination with other Integrated Pest Management (IPM) tools such as, biological controls, larvicides (Appendix A), and adulticides (Appendix B) when necessary.

In many cases, BMPs overlap with commonly used habitat management practices to conserve water and manage wetland vegetation for wildlife (Batzer and Resh 1992a, Batzer and Resh 1992b, Resh and Schlossberg 1996). Not all BMPs will be appropriate for a given wetland location or set of circumstances. Therefore, habitat managers are encouraged to work closely with both their local MVCD and agency biologists to select BMPs based on their potential effectiveness for regional or site specific conditions, and habitat management strategies. The implementation of BMPs will likely be limited by cost and personnel constraints, potential impacts on wetland habitat, and wildlife response to these measures.

In the following section, BMPs have been classified into five categories. These categories are not listed in order of importance and may be used in combination.

- Water Management Practices
- Vegetation Management Practices
- Wetland Infrastructure Maintenance
- Wetland Restoration and Enhancement Features
- Biological Controls

Following each category is a table summarizing the BMPs that outlines strategies, mosquito control objectives, advantages, and disadvantages (Tables 1 through 6).

Water Management Practices

Water management is one of the wetland manager's greatest tools for reducing mosquito populations (Table 1). However, it requires that water is readily available, of sufficient quantity and quality, and that the conveyance infrastructure is adequate to permit rapid flooding or drainage. In some instances, circumstances outside the control of wetland managers may limit the ability to implement water management BMPs. Such circumstances may include when agriculture drain water or delivered water is available for flooding, limited water quantity or poor water quality, and undersized water delivery or drainage infrastructure. In managed wetlands where these limitations are not an issue, the following water management practices should be considered.

Timing of Flooding: The timing of wetland flooding can greatly influence mosquito production (Fanara and Mulla 1974; Batzer and Resh 1992a). Delayed flooding may reduce mosquito production by shifting flooding schedules later in the year, when temperatures are cooler and mosquito production is less of a problem. Delayed flooding should be considered for wetlands with historic mosquito problems and those in close proximity to urban areas. However, delayed flooding means that less wetland habitat is available for wildlife during times of the year such as August and

September when wetlands are particularly limited. Delayed flooding may also have limited applicability for some properties that are required to take water on a "when available" schedule and have little control over the timing of flooding. Delayed flooding may be especially difficult for State and Federal areas that are obligated to provide "early" habitat to reduce crop depredation by waterfowl.

Given the limited feasibility of delayed flooding on some properties, phased flooding of wetlands may be useful to allow habitat managers to provide some level of early flooded habitat while delaying flooding on a portion of a property. Phased flooding involves flooding habitat throughout the fall and winter in proportion to wildlife need and takes into consideration other wetland habitat that may be available in surrounding areas.

For wetlands that are flooded early (August - early September) or in close proximity to urban areas, the use of vegetation and water management BMPs should be a high priority (Tables 1 and 2). *BMPs: Delayed or phased fall flooding, Early fall flood-up planning (see Table 1 for additional explanation)*

Speed of Wetland Flooding: As a general rule, the faster water can be applied during fall flooding and spring/summer irrigation, the fewer generations of mosquitoes will be hatched. Slow feather-edge flooding, although beneficial to foraging waterbirds, can produce multiple, staggered hatches of floodwater mosquitoes and, if treatment is necessary, often requires MVCDs to visit wetlands over a number of days for control activities (Garcia and Des Rochers 1983). Such an intensive treatment effort is expensive and results in additional disturbance to wildlife.

BMPs: Rapid fall flooding, Rapid irrigation (see Table 1 for additional explanation)

Water Control: Once wetlands have been flooded, it is important for wetland managers to ensure that pond elevations do not fluctuate except during planned draw-down or periods of low mosquito production (i.e. winter months). Fluctuating water levels tend to expose wetland edges to drying and provide suitable habitat for floodwater mosquitoes to lay eggs (Garcia and Des Rochers 1983). When water levels are subsequently raised, a new cohort of mosquitoes may be hatched. Water levels should be maintained by checking water levels frequently, and adding water to offset any losses. A constant maintenance flow of water will also help maintain steady water levels, improve water quality, and reduce stagnation.

If possible, wetlands can be flooded to deeper water depths during the fall and allowed to recede during the cooler winter months to provide shallow water depths for foraging waterbirds. Deeper water depths (24 inches) at initial flooding have been shown to significantly reduce mosquito densities at Grizzly Island Wildlife Area (Batzer and Resh 1992a, b).

When flooding wetlands, water sources containing mosquito predators should be used to help colonize wetlands with predacious insects or mosquitofish that are passively transported by water from upstream locations (Collins and Resh 1989). Predator populations can be maintained in permanent waterways used to flood seasonal wetlands. In the Suisun Marsh, where water is readily available for flooding, seasonal wetlands are often initially flooded, and if mosquitoes become abundant, water levels are drawn down to concentrate mosquito larvae in ditches for biological control, larvicide treatment, or to drown larvae through turbulent water movement (Chappell pers. comm). Following this action, wetlands are immediately re-flooded.

BMPs: Maintain stable water levels, Circulate water, Use deep initial flooding, Subsurface irrigate, Utilize water sources with mosquito predators for flooding, Flood and drain wetland (see Table 1 for additional explanation)

Frequency and Duration of Irrigation: Spring and summer irrigation is a common wetland management practice used to increase seed production and biomass of moist-soil plants (Naylor 2002), and reduce competition from undesirable plants in seasonal wetlands. The need to irrigate seasonal wetlands should be assessed closely by wetland managers. During years with above average spring precipitation, irrigations may not be necessary to maximize moist-soil plant production. When possible, managers should shorten the duration of irrigation to 4 to 10 days to reduce the likelihood of hatching floodwater mosquitoes and eliminate the possibility of creating habitat for standing water mosquitoes. However, shorter irrigations may not always be feasible, especially when growing more water intensive plants such as watergrass and smartweed, or when conducting flooding to control undesirable plant species. In the case of weed control, plants should be monitored and water held only long enough to eliminate weeds. The necessary timing can be determined when weeds have turned black or have disintegrated. Finally, following wetland irrigations, water should be drawn down into waterways containing mosquito predators that can consume any mosquito larvae which may have hatched.

BMPs: Reduce number of irrigations, Use rapid irrigation, Draw down and irrigate in early spring, Irrigate prior to field completely drying, Drain irrigation water into ditches or other water sources with mosquito predators, Use subsurface irrigation (see Table 1 for additional explanation)

Table 1. Water Management Practices to reduce mosquito production in managed wetlands.

Best Management Practice	Strategies	Mosquito Control Objective	Advantages	Disadvantages
Delayed or phased fall flooding	Delay flooding of some wetland units until later in the fall. Delay flooding units with greatest historical mosquito production and/or those closest to urban areas.	To delay initiation of floodwater mosquito production in seasonal wetlands by reducing the amount of mosquito habitat available during optimal breeding conditions (warm summer/early fall weather). Reduce the time available for standing water mosquito production in seasonal wetlands.	Depending on flood date, can reduce the need or amount of additional treatment. Delayed flooding can provide "new" food resources for wildlife later in the season when wetlands are finally flooded.	Reduces the amount of habitat for early fall migrants and other wetland-dependent species, and may increase potential for waterfowl depredation on agricultural crops (especially rice). Flooding is often dictated by water availability or contractual dates for delivery. Delayed flooding may still produce mosquitoes in warm years. Private hunting clubs can't lease blinds that aren't flooded.
Early fall flood-up planning	Apply BMPs to wetlands identified for early flooding. To the extent possible, areas targeted for early fall flooding should not be near urban centers and should not have a history of heavy mosquito production.	To reduce the early season production of mosquitoes or to reduce their encroachment on urban areas.	Allows for the provision of early flooded habitat while minimizing mosquito production and conflicts with urban areas.	Some additional effort required to monitor and identify suitable areas. Requires the extensive use of BMPs to ensure mosquitoes are not produced.
Rapid fall flooding	Flood wetland unit as fast as possible. Coordinate flooding with neighbors or water district to maximize flood-up rate.	To minimize number of mosquito cohorts hatching on a given area.	Reduces the need for multiple treatments needed by synchronizing larval development and adult emergence. In turn, reduces wildlife disturbance by MVCDs.	Requires coordination & ability to flood quickly. Reduces slow, feather-edge flooding that is heavily utilized by waterbirds.
Rapid irrigation	4-10 day irrigation (from time water enters the pond to complete draw-down).	Shorten irrigation period to reduce time available for mosquitoes (especially *Culex tarsalis* and *Anopheles freeborni*) to complete lifecycle.	Provides some level of wetland irrigation while reducing the time available for mosquitoes to complete lifecycle.	Requires ability to rapidly flood & drain wetland. If flooding is used for weed control, rapid irrigation may not be feasible.

Maintain stable water level (summer and early fall flooding)	Ensure constant flow of water into pond to reduce water fluctuation due to evaporation, transpiration, outflow, and seepage.	To reduce conditions for additional floodwater mosquito production in summer and fall.	Provides a stable wetland environment for breeding wildlife during spring and summer. Discourages undesired excessive vegetative growth which could also become additional mosquito breeding substrate.	Requires regular monitoring and adjustments to water control structures. May be difficult if water availability is intermittent or unreliable. Reduces mudflat habitat that is attractive to shorebirds and waterfowl.
Water circulation	Provide a constant flow of water equal to discharge at drain structure.	To keep water fresh and moving to deter stagnant conditions for mosquito production; reduces water level fluctuation and potential production of floodwater mosquitoes.	Discourages warm water conditions associated with avian botulism outbreaks.	Requires landowner to purchase additional "maintenance" water. May be difficult if water availability is intermittent or unreliable.
Deep initial flooding (18-24")	Flood wetland as deep as possible at initial flood-up.	To reduce shallow water habitat for mosquito breeding. May provide more open water by over-topping vegetation, thereby facilitating mosquito predation or wind action that drowns larvae.	Potentially slows mosquito development by eliminating warm, shallow water habitat.	Requires additional water and infrastructure adequate to flood deeply. Reduces shallow water foraging habitat for shorebirds and waterfowl.
Utilize water sources with mosquito predators for flooding wetlands	Flood wetlands with water sources containing mosquito fish or other invertebrate predators. Water from permanent ponds can be used to passively introduce mosquito predators.	To inoculate newly flooded wetlands with mosquito predators.	May establish mosquito predators faster than natural colonization.	Requires source of water with already established mosquito predators. Not applicable to wetlands flooded with well water.
Drain irrigation water into ditches or other water bodies with abundant mosquito predators	Drain irrigation water into locations with mosquito predators as opposed to adjacent seasonal wetland or dry fields.	To reduce the amount of larvae through natural predation and minimize the number of adults that emerge.	Already a common wetland management practice.	Must have ditch or water body with established predator population available to accept drain water.

Flood & drain wetland	Flood wetland and hatch larvae in pond. Drain wetland to borrow or other ditch where larvae can be easily treated, drowned in moving water, or consumed by predators. Immediately reflood wetland.	Hatches mosquito larvae and moves them to a smaller area for treatment before they can emerge as adults.	Can eliminate or reduce the need for additional mosquito control efforts.	Additional cost to purchase water to re-flood wetland. Timing is critical. Requires monitoring and is labor intensive.
Reduce number of irrigations	Evaluate necessity of irrigation, especially multiple irrigations, based on spring habitat conditions and plant growth. Eliminate irrigations when feasible.	To eliminate unneeded additional irrigations which could provide potential habitat for mosquitoes.	Reduces potential need for additional mosquito control. Saves water and manpower costs. Discourages excessive growth of undesirable vegetation (i.e. joint and bermuda grass)	May reduce seed production or plant biomass with less irrigation.
Early spring draw-down and irrigation	Draw-down wetland in late March or early April. Irrigate in late April or early May when weather is cooler and mosquitoes are less of a problem.	To reduce need for irrigation in June, July, and August, when potential for mosquito production would be higher.	Wetland irrigation can be accomplished without creating potential mosquito problems. May allow moist-soil plants to take advantage of natural rainfall during the spring.	Reduces shallow wetland habitat for migratory shorebirds and waterfowl in April and May, during a major migration period. Newly germinated wetland plants may be impacted by cold weather conditions. May stimulate germination and growth of undesirable wetland plants.
Don't let field completely dry and crack between spring draw-down and irrigation	Irrigate wetland before soil completely dries.	To eliminate necessary drying period for floodwater mosquito to lay eggs.	May reduce mosquitoes produced from irrigation	Requires close monitoring of soil moisture to correctly time irrigation.
Subsurface irrigation	Maintain high ground water levels by keeping boat channels or deep swales permanently flooded.	To reduce amount of irrigation water during mosquito breeding season.	Reduce need for surface irrigation while maintaining soil moisture to promote moist-soil plant production.	Requires deep swales or boat channels to be effective. Requires additional pipes in channels for equipment access. May not produce intended irrigation result if water table is naturally low. Requires that water be maintained longer than normal in swales. May promote unwanted vegetation growth in swales or promote irrigation of non-target plants in wetland.

Wetland Infrastructure Maintenance

Wetland infrastructure is the foundation for habitat management. A properly functioning water delivery and drainage system, well maintained levees, correctly operating water control structures, and efficient pumps are key to avoiding the unnecessary production of mosquitoes through simple neglect (Table 3). Time and money invested in these proactive maintenance activities will reduce mosquito production and help landowners avoid additional costs of controlling mosquitoes and unwanted vegetation when fall flooding or irrigating wetlands.

Levee and Water Control Structure Inspection and Repair: Levees and water control structures should be inspected on an annual basis to identify problem areas that may inadvertently leak water and produce mosquitoes. This includes identifying weak spots or rodent damage in levees that may seep water during flooding. Water control structures should be water-tight and properly sealed to prevent seepage.

Ditch and Swale Cleaning: Vegetation in water delivery ditches and swales can be problematic by creating habitat for mosquitoes or by simply impeding the flow of water that facilitates rapid flooding or drainage. Typical maintenance activities of water delivery and drainage ditches include the use of herbicides or periodic dredging to remove problem vegetation that inhibits water flow. Ditches and swales should be cut to grade to prevent the unintentional trapping of water. Likewise, silt that accumulates in front of outlet structures should be removed so it does not trap water in drainage swales.

Pump Tests and Repair: If wetland managers use pumps for flooding, periodic pump testing should be conducted to make sure pumps are operating at optimum efficiency. This will ensure that pumps are providing maximum output, and will facilitate rapid flooding.

Table 3. Wetland infrastructure maintenance activities used to reduce mosquito production in managed wetlands.

Best Management Practice	Strategies	Mosquito Control Objective	Advantages	Disadvantages
Levee Inspection & Repair	Walk or drive levees, flag problem spots, repair as needed. Consider design elements to improve integrity of levee (see levee design in Table 4).	To reduce mosquito habitat/production caused by seepage into adjacent fields or dry ponds.	Allows for early identification of problem spots. Helps conserve water and reduces growth of unwanted vegetation.	Requires annual monitoring and funding for repairs.
Water Control Structure Inspection, Repair, & Cleaning	Inspect structures and repair or replace as needed. Remove silt and vegetation build-up in front of structures. Adequately close, board or mud-up controls.	To reduce mosquito habitat/production caused by seepage into adjacent ponds or drainage ditches. Remove silt blockages that may trap water and impede drainage.	Enhances water management capabilities and limits unwanted vegetation or standing water.	Requires annual monitoring and funding for cleaning or repair.
Ditch Cleaning	Periodically remove silt or vegetation from ditches to maintain efficient water delivery and drainage.	To allow for rapid flooding/drainage & reduce vegetation substrate for breeding mosquitoes.	Enhances water management capabilities and limits unwanted vegetation or standing water.	Requires funding for ditch cleaning. Excessive vegetation removal on ditch banks can result in negative impacts to nesting birds and other wildlife.
Pump Tests & Repair	Test pump efficiency and make any necessary repairs to maximize output.	Could identify output problems and if corrected, allow managers to flood more rapidly.	May promote faster irrigation and flood-up if output can be improved.	Requires pump test. May be costly to repair or replace pump/well.

Wetland Restoration and Enhancement Features

All well planned wetland restoration and enhancement projects begin with an initial survey and design phase. It is during this phase that landowners and restoration biologists have the opportunity to discuss design features with MVCDs and incorporate BMPs to reduce mosquito production. Time spent at the design stage can save thousands of dollars in annual operation and maintenance costs and prevents problems resulting from poor water management and unintended mosquito production. Wetland design typically focuses on aspects of water control that promote vegetation beneficial to wildlife, conserve water, and allow for periodic vegetation control. In turn, water control is also an important mosquito BMP (Sacramento-Yolo Mosquito and Vector Control District 2008, Contra Costa Mosquito and Vector Control District 2001). **Wetland design features to reduce mosquito production:** Wetland design features that reduce mosquito production include independent flooding and drainage capabilities of wetland units, size considerations in the design of wetland units to facilitate rapid flooding, and the incorporation of design features that promote habitats for mosquito predators and allow those predators access to mosquitoes. Water delivery ditches, water control structures, and levees should be designed and built to specifications that prevent wind and water erosion, provide equipment access for maintenance activities, and reduce damage caused by burrowing animals (Table 4). These design features will facilitate other mosquito BMPs such as water and vegetation management practices, infrastructure maintenance, and natural mosquito predation.

BMPs: Independent water management, Adequately sized water control structures, Swale construction, Wetland size consideration, Ditch design, Levee design & compaction, Deep channels or basins constructed in seasonal wetlands, Permanent water reservoir that floods into seasonal wetlands

Print Form

Appendix C

Notice of Completion & Environmental Document Transmittal

Mail to: State Clearinghouse, P.O. Box 3044, Sacramento, CA 95812-3044 (916) 445-0613
For Hand Delivery/Street Address: 1400 Tenth Street, Sacramento, CA 95814

SCH #

Project Title: Sherman Island Whales Mouth Wetland Restoration Project

Lead Agency: Reclamation District 341 — Contact Person: Jesse W. Barton

Mailing Address: 1112 I Street, Suite 240 — Phone: 916-444-2880

City: Sacramento — Zip: 95814 — County: Sacramento

Project Location: County: Sacramento — City/Nearest Community: Rio Vista

Cross Streets: Sherman Island — Zip Code: 94571

Longitude/Latitude (degrees, minutes and seconds): 38 ° 2 ' 29.03" N / 121 ° 46 ' 24.56" W Total Acres: 877

Assessor's Parcel No.: 158-0090-016-0000 — Section: 4-5, 8-9 Twp.: 2N Range: 2E Base: MDBM

Within 2 Miles: State Hwy #: 160 — Waterways: Sacramento

Airports: none — Railways: none — Schools: none

Document Type:

CEQA: ☐ NOP ☐ Draft EIR — NEPA: ☐ NOI — Other: ☐ Joint Document
☐ Early Cons ☐ Supplement/Subsequent EIR ☐ EA ☐ Final Document
☐ Neg Dec (Prior SCH No.) ☐ Draft EIS ☐ Other:
☒ Mit Neg Dec Other: ☐ FONSI

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Local Action Type:

☐ General Plan Update ☐ Specific Plan ☐ Rezone ☐ Annexation
☐ General Plan Amendment ☐ Master Plan ☐ Prezone ☐ Redevelopment
☐ General Plan Element ☐ Planned Unit Development ☐ Use Permit ☐ Coastal Permit
☐ Community Plan ☐ Site Plan ☐ Land Division (Subdivision, etc.) ☒ Other: Habitat Rest.

Development Type:

☐ Residential: Units ____ Acres ____
☐ Office: Sq.ft. ____ Acres ____ Employees ____
☐ Commercial: Sq.ft. ____ Acres ____ Employees ____
☐ Industrial: Sq.ft. ____ Acres ____ Employees ____
☐ Educational: ____
☐ Recreational: ____
☐ Water Facilities: Type ____ MGD ____
☐ Transportation: Type ____
☐ Mining: Mineral ____
☐ Power: Type ____ MW ____
☐ Waste Treatment: Type ____ MGD ____
☐ Hazardous Waste: Type ____
☒ Other: Habitat Restoration

Project Issues Discussed in Document:

☐ Aesthetic/Visual ☐ Fiscal ☒ Recreation/Parks ☐ Vegetation
☒ Agricultural Land ☐ Flood Plain/Flooding ☐ Schools/Universities ☒ Water Quality
☒ Air Quality ☐ Forest Land/Fire Hazard ☐ Septic Systems ☐ Water Supply/Groundwater
☒ Archeological/Historical ☒ Geologic/Seismic ☐ Sewer Capacity ☐ Wetland/Riparian
☒ Biological Resources ☒ Minerals ☐ Soil Erosion/Compaction/Grading ☐ Growth Inducement
☐ Coastal Zone ☐ Noise ☐ Solid Waste ☒ Land Use
☐ Drainage/Absorption ☐ Population/Housing Balance ☒ Toxic/Hazardous ☐ Cumulative Effects
☐ Economic/Jobs ☒ Public Services/Facilities ☒ Traffic/Circulation ☐ Other:

Present Land Use/Zoning/General Plan Designation:

AG-80

Project Description: *(please use a separate page if necessary)*

This project comprises a total of 877 acres within which a total of 600 acres of palustrine emergent wetlands will be restored through a combination of reestablishment and rehabilitation. The underlying purpose of the project will be to stop or reverse subsidence, create habitat, and sequester atmospheric carbon. By maintaining permanent and adequate water levels, the growth and subsequent decomposition of emergent vegetation is expected to grow peat, which will raise surface elevations on the property. The parcel is expected to provide year-round wetland habitat for waterfowl and other wildlife. The project is also anticipated to provide climate benefits by sequestering atmospheric carbon that will help provide a net reduction in greenhouse gases.

Note: The State Clearinghouse will assign identification numbers for all new projects. If a SCH number already exists for a project (e.g. Notice of Preparation or previous draft document) please fill in.

Revised 2010

Print Form

Summary Form for Electronic Document Submittal

Form F

Lead agencies may include 15 hardcopies of this document when submitting electronic copies of Environmental Impact Reports, Negative Declarations, Mitigated Negative Declarations, or Notices of Preparation to the State Clearinghouse (SCH). The SCH also accepts other summaries, such as EIR Executive Summaries prepared pursuant to CEQA Guidelines Section 15123. Please include one copy of the Notice of Completion Form (NOC) with your submission and attach the summary to each electronic copy of the document.

SCH #: _____

Project Title: Sherman Island Whales Mouth Wetland Restoration Project

Lead Agency: Reclamation District 341

Contact Name: Jesse W. Barton

Email: jbarton@gallerybartonlaw.com Phone Number: 916-444-2880

Project Location: Rio Vista, (*City*) Sacramento (*County*)

Project Decription (Proposed actions, location, and/or consequences).

The Sherman Island Whales Mouth Wetland Restoration Project will restore approximately 600 acres of palustrine emergent wetlands, within an 877-acre Project boundary, on a nearly 975-acre parcel of property on Sherman Island that is owned by the California Department of Water Resources. The property is currently managed for flood irrigated pasture which includes a regular and extensive disturbance regime associated with the grazing.

The site will be graded to the extent necessary to sculpt the swales and to create berms for this wetland habitat area. An additional import of approximately 80,000 cubic yards of material will be required for redistribution. Water levels in each wetland unit will be managed independently to restore the desired emergent wetland conditions throughout the site. When the project is completed, water is proposed to be maintained in the project area year-round, effectively creating a permanent wetland.

The ultimate outcome of the restoration project will be hundreds of additional acres of freshwater emergent wetlands. Each wetland unit will be a mosaic of open water channels and emergent vegetation comprised predominantly of California bulrush and narrow leaved cattails. Other native plant restoration components will include installation of native trees and shrub compatible with their respective hydrologic regime as well as a substantial amount of upland transitional area, all of which will provide great diversity of habitat.

Identify the project's significant or potentially significant effects and briefly describe any proposed mitigation measures that would reduce or avoid that effect.

The only possible potentially significant environmental effects are those associated with biological resources. Western pond turtle, giant garter snake, and Swainson's hawk, White-tailed kite, Loggerhead shrike, Modesto song sparrow, and Migratory Birds & Birds of Prey, may be impacted by the Project. As a result, construction windows have been modified and adopted to reduce the likelihood of interaction between these species and the construction work. In addition, a qualified biologist will perform pre-construction surveys to determine the presence or lack of presence of these species. If species are determined to be present, various buffer zones will be established, and modifications to the Project may be made.

Revised September 2011

If applicable, describe any of the project's areas of controversy known to the Lead Agency, including issues raised by agencies and the public.

As of this date, we are aware of no areas of controversy. The Project has generally been well received.

Provide a list of the responsible or trustee agencies for the project.

California Department of Fish and Wildlife
Central Valley Regional Water Quality Control Board
Department of Water Resources